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Investigating Successful Enterprise Resource Planning Implementation in Higher Education Institutions

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PhD Abstract

This thesis investigates the successful implementation of Enterprise Resource Planning (ERP) in Higher Educational Institutions (HEIs). ERP is a business management system that has emerged to support organisations with a system of integrated applications to enhance their Information Technology (IT) infrastructures, enhance business processes and deliver a high quality of services. Research indicates limited success for implementing numerous ERP ventures and failure rates estimated between 60% and 90%. The failure of ERP implementation in higher education institutions (HEIs) worldwide is much higher in comparison to other sectors, such as banking or manufacturing, yet limited research has been conducted on this issue. There is a lack of sufficient knowledge, expertise and training to implement such sophisticated integrated systems and top management lacks the ability to take appropriate decisions for ERP implementation. However, merely focusing on several factors influencing ERP implementation may not suffice, as there is a need for a systematic decision-making process for adopting and implementing ERP systems in HEIs. The limited number of ERP applications being used in HEIs has resulted in inadequate research and many issues which require further exploration. Despite this, all the implications for successful implementation of ERP systems have yet to be assessed in HEIs, making it a relevant area for study and creating a need for a unique piece of research work. Thus, the researcher demonstrates that it is of high importance to investigate this area and contribute towards successful ERP implementations.

The present study adopted an interpretivist research philosophy and the approach was inductive in nature. To collect the data from the selected case studies, a semi structured interview protocol was designed in accordance with the research objectives which was aimed at getting the views and opinions of both the higher management personnel as well as technical level staff from the selected sample of universities. The study was focused on the implementation of ERP systems for higher education institutions in Jordan. Jordan has the highest demand for higher education in the region and the number of enrolments is growing annually. The demand for ERP systems in Jordan is rising owing to the rapid growth of the Internet and mobile users and the increase in the literacy rate. The content analysis technique was used supported by NVivi11 software to

process the data gathered from the sample. The key success factors identified from the participants were split into technical, organizational, project and project support categories.

This research made several contributions to knowledge. These included 1) the identification and characterisation of three new sector and context-specific KSFs, namely: the selection of the right ERP system; the need for qualified IT staff for in-house maintenance and fair vendor relations. 2) The development of a framework for enhancing ERP implementation. 3) Evaluation measures of ERP performance from an organisational, technical, project, and project support system perspective. 4) Development of a synthesized model that contains mapped and prioritised KSFs on the ERP implementation lifecycle based on their importance for successful implementation.

In addition to these reflected theoretical contributions, this research also highlights the implications on the practices of higher education institutes, particularly for, but not limited to, Jordanian HEIs. The research findings provide an insight into the KSFs that are important for the successful implementation of ERP systems, identifying two new implementation lifecycle stages, the influential factors being mapped across the lifecycle phases providing a more detailed and in-depth understanding of what is required.

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First and foremost, my gratitude would be absolutely incomplete if I would not thank Allah the Almighty for his blessings and guidance in giving me the strength, courage, patience and perseverance to endure this long and challenging study journey to achieve my dream. All good things that I have in my life are because of his Love and Mercy. God be praised!

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CHAPTER 1 RESEARCH INTRODUCTION

1.0 Research Background

Enterprise Resource Planning system is the most widely used integrated software system for the management of organisational operations. Various areas and departments of an organisation can be linked together through an ERP system which includes modules for human resource management, stock and inventory control, suppliers, customers, finance, manufacturing, services, and users. An ERP system shares the data from all these areas and can be communicated to all its stakeholders. Many of the organisations around the world have started utilizing the ERP systems as an integrated business computing solution. ERP systems are considered as a successful tool for the reduction of costs and enhancement of business processes. Various advantages and benefits have been identified and listed by scholars for the implementation of ERP systems in organisations. Whereas many disadvantages or drawbacks are also highlighted such as cost appropriateness, time management, complex to understand, need for customization, and maintenance issues. ERP systems have also gained popularity in higher education institutions all around the world.

ERP systems can be helpful for higher educational institutions for faster accessibility to information about students and staff for management of the institution. Moreover, services rendered to students, faculty members and staff can also be enhanced and cost management for running expenses, remuneration, and financial matters can be efficiently integrated through a successfully implemented ERP system.

The present study is aimed at investigating facts for the successful implementation of ERP systems in higher educational institutions (HEI's). The study is focused on implementing systems in HEIs in Jordan. Three case studies were selected to conduct the qualitative research and these case studies were selected based on purposive homogenous sampling in which the common characteristic was ERP implementation and its post implementation phase. The present study adopted interpretivism as the research philosophy and the research approach was inductive in nature. To collect the data from the selected case studies, a semi structured interview protocol was designed in accordance with the research aims and objectives to get the views and opinions of higher management as well as technical level staff from the selected sample. The data

gathered from the sample was analysed through the content analysis technique with the support of NVivo 11 software. While analysing the responses from the participants the critical success factors for the implementation of ERP system in HEIs were categorized under four heads namely technical, organisational, project and system support. The success factors were then mapped to the ERP implementation phases to understand the importance of each factor at each phase of the implementation

The exploratory study identified that the university in case study one (HEI_I) had implemented a second ERP system. The most important key success factor for case study one (HEI_I) was the selection of the right ERP system because choosing an inappropriate system had caused the failure of the first system. For the second case study (HEI_II) the most important key success factor was the provision of qualified IT staff for in-house maintenance because the technical staff were responsible for implementing the future software upgrades as well as the ongoing maintenance of the system. The views of the interview participants for case study two was that the implementation of the ERP system was successful. In the case of the third case study (HEI_III), the relationship with the vendor which was not impartial influenced the selection of the ERP system as well as the acceptance of new system by the users. The interview participants were undecided as to whether the ERP system in case study 3 was a success or failure.

The study identified the importance of each factor at each phase and stage of ERP implementation to help other HEIs who were in the process of adopting an ERP system to achieve a successful implementation. The study considered what HEIs expected the ERP systems to deliver, to achieve their targets and bring about an improvement in overall business performance. From the results of the three case studies, the study also highlighted two new stages in the ERP implementation lifecycle which were “testing” and “go live”. These stages were added to the implementation phase of the life cycle. The recommendations provided from the research should be helpful for other HEIs to achieve a successful ERP system implementation.

1.1 Research Issue

HEIs are under pressures from every direction, from reduced government funding to expectations by students and parents to deliver ever higher quality services at a lower cost (Englund, Olofsson and Price, 2016). Therefore, HEIs need systems that manage and integrate their entire operation to adjust to the external changes and for the smooth running of the institutions (Al-Hadi and Al-Shaibany, 2017). The HEIs not only have to provide education but are also responsible for many activities like admissions, placements, financial management and payroll, library management, and many other processes. It is believed that Enterprise Resource Planning (ERP) system can help to automate all the internal and external processes in HEIs (Noaman and Ahmed, 2015). It is also suggested that the automated process will ease communication between all the stakeholders.

Research indicates limited successes for implementing ERP systems with failure rates high at 60% to 90% (Tarhini et al., 2015; Xia et al., 2010; Al-Shamlan & Al-Mudimigh, 2011; Elragal and Haddara, 2013). On the other hand, the failure of ERP implementation in Universities is higher than that of any other organisations (Noaman and Ahmed, 2015). This highlights the importanxe of reducing the failure rates of ERP system in universities in the higher education sector (Davis, 2007).

The Literature indicates that two approaches are generally used for the introduction of ERP systems. It is either based on finding the appropriate fit to bring about organisational change (Davenport 2000) or to meet a strategy or business opportunity (Themistocleous and Irani, 2002). However, the selection of ERP systems to improve organisational performance was a critical issue for HEIs in developing countries (Al-Mashari et al., 2003; Al-Mashari et al., 2006). Such ERP systems are highly complex yet significant, simultaneously influencing the efficiency and efficacy of businesses – classifying them as highly complicated starting from adoption to implementation to realising their benefits (Remus, 2007). Researchers also argue that different ERP lifecycle phases require decision making at every stage of internal integration and external collaboration; nevertheless, reasons for adoption, project team selection, resource allocation, can create hurdles in realising the post-implementation benefits of ERP (Al-Mashari et al., 2006). It can be

inferred from this discussion that although ERP systems are complex, these systems primarily support the decision makers in the effective management of organisational resources.

Thus, analysing such issues would provide more insights for understanding the implementation of ERP systems. Added to this, when a client requires a tailor-made ERP system for their organisation, it increases the time for the vendor and project team to understand what is involved in the design of the ERP system (Scheer and Habermann, 2000). A lack of suitable skills from top management, project team or ERP vendor can cause failure of the implementation of the system in HEIs. ERP systems have evolved to improve organisational performance and have both strategic and tactical usage (Holland and Light, 1999). However, the major issue does not seem to be seeking the approval of top management to invest in ERP but is mainly in the design of the implementation process. The investment in human capital and finance are not realised when implementation and post-implementation failure rates are as high as 70% (Al-Mashari, 2003; Nah et al., 2007; Dezdar and Sulaiman, 2009). Another major issue with ERP is an alignment between objectives for adoption and the utility sought by the organisation (Dawson and Owens, 2008). From its evolution, ERP has been termed as a change agent, integrated system, business process tool, software, a major project and a restructuring programme (Shang and Seddon 2000; Markus and Tanis 2000). This has led to ERP becoming a multi-tasking system being associated with organisational improvements in structure, business process, management, communication, function, etc. (Jack, Kholeif, 2008). In the preceding years, employing a variety of ways to adopt and implement ERP systems has increased the ambiguity surrounding the input – output analysis of ERP phenomena. Exclusion of any such ambiguity is another theoretical ERP issue to be addressed. The major reason for this ambiguity can be attributed to a plethora of adoption objectives and approaches reported in both IS and more specifically, ERP literature (Francoise et al., 2009). In summary, the issues are: the low implementation success rates, lack of organisational capabilities to implement ERP systems, inappropriate designs and alignment with existing IT infrastructure, mismatches between utility and adoption objectives, and ambiguity in theoretical developments in the literature (Parr and Shanks, 2000; Levy et al., 2001; AlMashari et al., 2006; Bhagwat and Sharma, 2007).

This research collates evidence from three Jordanian HEIs on the implementation of ERP systems. Jordan has an increasing demand for higher education, which is the highest in the Middle East as the number of enrolments were growing at a higher rate every year (Alomari, 2009). After observing university sector growth in ERP systems worldwide, Jordanian HEIs have started to respond (Sbool, 2006). ERP systems have offered an alternative approach to Jordanian HEIs which has encouraged them to re-evaluate their operation processes. By opting for new systems these institutions have an opportunity to imbibe new information technologies that increases communication and thus performance. According to Sbool (2009) The demand for ERP systems in Jordan is rising and the reasons for this rise include the rapid growth of the internet and mobile users and the increase of the literacy rate, which is the highest in the Middle East region (Hinnawi, 2011). Due to the development of new technology in the IT domain, it is important for HEIs to adapt to the new technology, redesign trends in teaching and develop new researchers in the field of education (Diabat, 2011). The rise in demand from students to change the teaching pedagogy from the traditional lecture method also drives higher education institutions to opt for ERP systems that can give online study and e-learning programs.

1.2 Research Questions

1.2.1 Primary Questions

1- How can the success or failure of ERP systems implementation in HEIs be measured?

2- How ERP systems can be implemented successfully in HEIs?

1.2.2 Secondary Questions

1- What are the problems that HEIs are facing in the implementation of ERP systems?

2- What are the key success factors influencing effective implementation of ERP systems in HEIs?

3- How do these identified key success factors impact the ERP implementation lifecycle in HEIs?

1.3 Research Aim and Objectives:

The aim of this research is to successfully implement ERP system in the higher education institutions sector, by meeting the following objectives:

1- To identify problems in the implementation of ERP in HEIs context,

2- To identify and investigate the key success factors influencing ERP implementation in HEIs,

3- To develop a framework for evaluating and assessing the success of ERP implementation in HEIs

4- To prioritise all the identified key success factors and map them to the ERP implementation lifecycle.

1.4 Intended Research Contributions

1.4.1 Contribution to Theory (Knowledge)

The contribution to knowledge of this research includes: The identification of Key Success Factors (KSFs) for the implementation of ERP systems in the HEIs sector. Also, the provision of evaluation measures for the success of the ERP implementation from organisational, project, system support, and technical perspectives. Furthermore, a synthesised model mapping KSFs on the ERP implementation lifecycle for successful implementation of the ERP system from different perspectives. Finally, the originality of the work has been particularly observed in the new key success factors identified, being: the right ERP system, qualified IT staff for in-house maintenance and fair vendor relations.

1.4.2 Contribution to Practice

In addition to the reflected theoretical contribution, this research also highlights the implications on the practice of HEIs, particularly for Jordanian HEIs, which are as follows:

The research findings provide an insight to the KSFs that influence successful ERP implementation, the key success factors which are influencing successful ERP implementation in higher education institutions are prioritized according to their importance and grouped under specific category heads, the originality of the research work is claimed by the identification of two new ERP implementation lifecycle stages which are “testing” and “go live to be added to the implementation phase. The influential factors are mapped across the ERP implementation lifecycle phases providing a more detailed and in-depth understanding. By considering all the factors and following the recommendations and guidelines given will enable HEIs to enhance the success of their ERP implementation. All the above-mentioned contributions assisted the researcher in the design of a synthesised model for HEIs, mapping the influential factors to the ERP implementation lifecycle phases which was one of the objectives of the study. It is asserted by the researcher that the model presented in this research will provide guidance for the top management and technical staff of HEIs when facing different issues during the adoption of ERP systems.

1.5 Overview of Research Methodology

In the view of Leedy (2005) research is an accepted method for finding answers to a problem and deciding on the appropriate research methodology plays a very important part in defining the steps to be taken in to complete the research study. In the social sciences, there are two research choices available which are the qualitative and quantitative approach. A combination of both the approaches can also be used for a research study.

The Qualitative approach is flexible and subjective in nature and enables the researcher to perceive events from the point of view of an insider and provides a strong sense of context and importance to events that have occurred in the past and connects them to the future outcomes. As the objective of the research is to investigate, interpret and obtain a deeper understanding of a problem i.e. implementation of ERP systems in HEI, qualitative methods are the most appropriate one to use as they aim to make sense of and interpret phenomena in terms of the meanings people bring to them. The research philosophy chosen for this research is interpretivism using case studies is used to conduct an extensive and in-depth research of three Jordanian universities. The case study method is the best way to review the qualitative results that allow different and novel concepts to be created. The use of case studies enables the researcher to understand more clearly the usage, impact, benefits, quality and challenges of existing ERP systems HEIs. In this research study the primary source of data collection is the interview technique while the secondary data is obtained from published information. The selected data collection techniques help the researcher to acquire the relevant information about ERP systems by interviewing management and technical staff from the three selected Jordanian HEIs. A semi-structured interview protocol is used enabling the researcher to gather answers to specific questions to meet the aims and objectives of the study.

1.6 Thesis Outline

This section provides the outline of the remaining chapters of this thesis. Chapter 1 is this introduction. Chapter Two critically analyses the research context and identifies the research issues. Chapter Three focuses on the theoretical foundations for the study and the development of a conceptual model for the research. Chapter Four describes the philosophy, approach and methods selected for this research and justifies the selections made. Chapters Five, Six, and

Seven, presents the results from each of the case studies for the selected HEIs. Chapter Eight presents a comparative analysis of the case studies. Chapter Nine proposes a model for the ERP implementation lifecycle for HEIS based on the evaluation of evidence from the literature review and the empirical findings from the case studies. Final, Chapter Ten describes the research summary, main contribution, research limitations, a set of recommendations for the industry managers and practitioners, and suggestions for further research.

Chapter One: Research Introduction

This chapter starts by presenting an introduction to the main issues and research problem that exists for HEIs in the ERP domain. These issues consider the need to understand ERP implementation practices and improve the decision-making process in HEIs. It also has provided the main aim and objective of research as a foundation to build this thesis.

Chapter Two: Research Context

This chapter starts to review the literature on IT implementation practices in HEIs, highlights several IT infrastructure limitations in HEIs, emphasizes the need for improving the IT infrastructure of HEIs, analyses ERP literature and explains benefit realisation, implementation challenges and ERP failure. Then the researcher examines the research context identifying key challenges and problems for the implementation of ERP in Jordanian HEIs.

Chapter Three: Literature Review

The researcher discusses ERP implementation, factors for ERP implementation and ERP implementation lifecycle phases. Furthermore, justifying the need for a collective and systematic approach for adopting and implementing ERP in HEIs. This chapter reviews literature regarding (a) the KSFs, (b) relevant IS (Information and System) models, and (c) ERP implementation lifecycle phases and stages. Drawing on a synthesis of the theoretical underpinnings, a conceptual framework for successful ERP implementation in HEIs is developed for this research.

Chapter Four: Research Methodology

This chapter aims to prepare a research plan which will eventually lead to the assessment and evaluation of the proposed conceptual model as described in Chapter Three. In this chapter also, the researcher describes and justifies the selection of an appropriate research methodology for achieving the research work presented in this thesis.

Chapter Five, Six, Seven, and Eight: Research Analysis and Findings

These chapters analysed and presented case studies that were conducted in three Jordanian higher educational institutions. The results of secondary and primary data collected provide the major findings and discussion of the background to the case studies, ERP project process, state of ERP, and assessing the research propositions.

Chapter Nine: Discussion and proposal

This chapter updates literature with revised KSFs for ERP implementation in HEIs. Further, in this chapter, based on case studies findings, a model of ERP implementation lifecycle is proposed.

Chapter Ten: Conclusion

This chapter outlines the research overview employed in this thesis. It discusses the main contributions of this thesis. Then, this chapter moves onto highlighting the research limitations that requires further attention. Lastly, based on the overall research conducted in this thesis, the researcher presents some key recommendations.

CHAPTER 2 RESEARCH CONTEXT

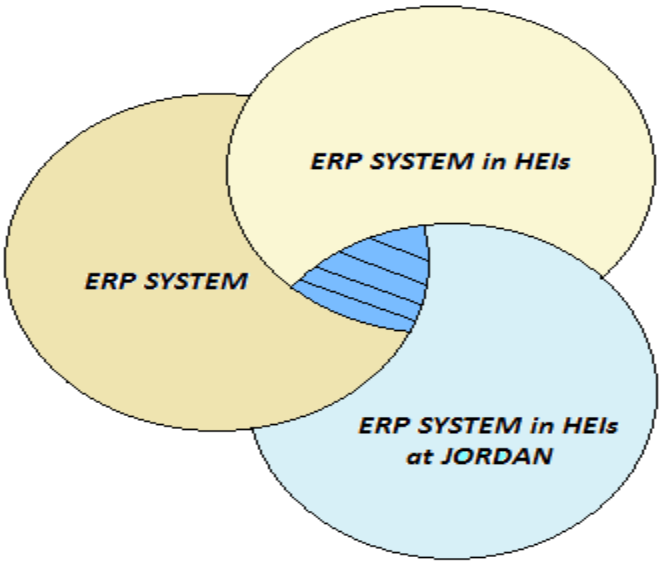

Figure 2. 1 Area to be covered

2.0 Chapter Overview

This chapter examines the research context identifying the key challenges and problems for the implementation of Enterprise Resource Planning (ERP) in Higher Educational Institutions (HEIs) through the lens of HEIs in Jordan (Figure 2.1).

Most of the existing research focuses on the Key Success Factors (KSFs) and process of implementation from the aspect of technologies and systems. There are some studies highlighting benefits and challenges in the organisational context. However, they only examine it from either a technical or organizational perspective (Lechtchinskaia, Uffen and Breitner, 2011). In addition, limited research has found regarding the impacts, benefits, or challenges of ERP systems in Jordanian HEIs, although Jordanian HEIs have already gone through a series of changes, especially in the incorporation of technology and implementation of various ERP systems. This research will fill in the identified gaps and make a significant contribution to enhance ERP practices and performance in Jordanian HEIs.

2.1 Enterprise Resource Planning Systems (ERP)

According to Klaus, Rosemann, and Gable (2000, p: 24), ERP systems can be described as "comprehensive packaged software solutions that seek to integrate the complete range of a business's processes and functions in order to present a holistic view of the business from a single information and IT architecture." An organisation's various functions, such as manufacturing, human resources, material management, suppliers, customers, and financial systems are linked. All of these can be integrated firmly into a system to share data and be visible for all (Chen, 2010). From the early 1990s, organisations have started to depend largely on ERP systems to link their internal functions and the use of information technology in the ERP segment is seeing continuous and fast growth (Lou and Strong, 2004). The reason behind this phenomenal growth is the promise that ERP systems can provide an integrated business computing solution and improve a company's ability to compete in the marketplace (Kvavik and Katz, 2002).

Presently the purposes, emphases, and reasons for the purchase and implementation of ERP systems are stronger than ever before, according to Arif et al. (2004), Swartz (2000), and Sawyer and Southwick (2002). When considering the implementation of ERP in many varied projects, the main and most important reasons for the existence of ERP systems is for the implementation of ERP for reengineering, business process analysis, best practice analysis, and utilization of transaction processing systems (Kock, 2002; Kvavik and Katz, 2002; Holsapple and Sena, 2003; Al-Mashari, 2003; Arif et al., 2004; Esteves and Pastor, 2004; Gattiker and Goodhue, 2005).

For improvement of business processes and reducing costs, ERP systems are successful, according to Nah et al. (2001) and Beheshti (2006). This is because the system facilitates, communication and coordination, centralises the administrative activities, improves the ability to install the functionalities and reduces the cost of maintenance for information systems (Siau, 2004). When implemented successfully in an organisation, ERP systems prove to be the backbone of business intelligence since it gives managers an incorporated vision of the various processes in the business (Parr and Shanks,2000; Nash, 2000). Various departments in an organisation are connected for sharing and viewing data only because of ERP systems. Seamless incorporation of the processes with enhanced workflow in all the functional areas is provided, along with the

standardisation of various business customs which are standardised, as well as access to real-time current data. (Mebert et al., 2003; Ehie and Madsen, 2005).

Even though there are lots of noteworthy benefits due to the implementation of ERP systems, drawbacks also exist. These drawbacks are found during the implementation phase. According to Shehab et al. (2004), the implementation and then the customisation process is costly, time consuming, and difficult. It is costly due to matching business process reengineering with software customisation. A lot of time is consumed in matching the functionality scope of the software and the requirements of the organisation. Therefore, the whole process of ERP implementation becomes a difficult task (Grabski and Leech, 2007) due to the time taken (many days, months, or years) for the exact incorporation (Davenport, 1998; Adam and O'Doherty, 2000; Yusuf et al., 2004). The investment is also needed to pursue ways of reducing the complexity of software implementation (Nah et al., 2001). As well as the difficulties involved, the time taken to complete the implementation can exceed the estimated budget and the plan can go astray, possibly ending in reduced implementation effectiveness (Soja, 2006), but there is a solution to this long complex implementation. If the approach is well managed and follows a disciplined plan and structure, the implementation can be done in a better way (Umble et al., 2003). However, a major problem with this kind of application is that the failures in ERP implementation have led organisations to bankruptcy and thus serious complexities do arise. (Davenport, 1998; Beheshti, 2006). Although the risks are high, the advantages to be gained are much higher so many organisations are continuing to implement such systems. The costs involved in implementing ERP systems globally are very high. In 1997 the amount spent to purchase ERP systems in the US was US$10 billion (Volkoff et al., 1999). Additionally, as cited in Katerattanakul et al (2006) according to the International Data Corporation (IDC), the market for ERP in 2008 would increase to an estimated US$36.1 billion.

2.2 ERP Implementation at HEIs

2.2.1 The Need for ERP at HEIs

In recent years, several higher education institutions have taken advantage of ERP systems. Such institutions have invested huge amounts in ERP projects that generally go on for a few years but fail to deliver the results over a long period of time. The basic idea associated with ERP traditionally lies with the integration of several functions of a typical manufacturing company. However, the scope of ERP is now broadened with their applicability becoming possible in other areas and industries like the educational sector. In the field of higher education, ERP systems develop in the direction of support for key administrative and academic activities. Generally, the core of such a system is focused on minimal activities like the administration of students, management of human resources, payroll systems and financial services. However, it is always possible to include an array of functions in ERP systems resulting in a collaborative functioning of all departments involved in student registration, monitoring and development activities for the institutions. There are certain unique advantages that higher educational institutions can avail themselves of through the implementation of ERP system. These merits can take the form of: improved accessibility to information for the planning and management of the institution; improvement in services for the faculties, students and staff members; decreasing the risk associated with business operations; and increasing the income, while decreasing the expenses resulting from the improved efficiency of the institution.

In relation to higher educational institutions, the process of ERP system implementation is different from that followed in a manufacturing enterprise. Here support from key administrative and academic services is necessary to direct the implementation where it then becomes possible to access an improved degree of information for planning and managing the institution.

The integration of various functions of the educational institutions will help in integrating the systems for human resource management with the student administration and financial systems, thereby reducing the dependency on separate and incompatible information between faculties and functions. Through ERP system implementation, it is possible to transfer data between individual processes making it accessible to various users in real time (Wanare and Mudiraj, 2014). The integration of up-to-date approaches for information access including web technologies, mobile applications and on-line services proves to be beneficial for the students

and administration of the institution as well as for those regularly interacting with the institution. Despite the above discussed benefits and synergies of ERP implementation, many educational institutions find it challenging and expensive to implement such a system (Zornada, 2005). However, this is not the case in practical terms and higher education institutions should try to ensure the successful implementation of ERP systems by considering it a business-wide initiative. Therefore, it may prove to be challenging for an educational institution to implement an ERP system, without doing the required research for understanding the process of implementation and the nature of ERP modules, before bringing in the change across the organization. However, it is always possible to get expert help and assistance together with the necessary commitment from senior management to design specific implementation strategies for ensuring a smooth transition to a new system of working.

2.2.2 Drives for HEIs to implement ERP systems

Today technology allows many changes and it is a boon for altering the ways in which education providers need to operate. Recent trends in education have led to a proliferation of studies proposing that education today is moving towards the need for more practical features. It has also become more challenging to satisfy the diversified requirements of every stakeholder. There is an intense competition amongst the providers of education. To be in the race, universities globally are investing a lot in technology to satisfy the needs of the students and to be in the forefront for information technologies.

An ERP platform is multifunctional not only helping to streamline the business process of a university but also supporting the students, faculties, and the alumni, who are the stakeholders in the institution. Turning to the integration process for the institute's built-in operations like student administration, human resources, and financial systems (Murphy 2004), unlike industrial organizations, educational institutions are very different because the environment is dynamic and ever evolving. Technology is used for several purposes, but the primary purpose is for academics, most ERP technologies being used for the interaction between the faculties and staff members for different activities in the institution.

2.2.3 HEIs substantial investment in ERP systems

There is a record which says that the higher education institutions have invested more than 5 billion in the past years in ERP (Rabaa'i, 2009). The main goal of ERP implementation in the educational institutions, including colleges, schools, and other related departments worldwide, is to provide them with an exclusive ability to do research and teach at a reasonably low cost (Watson, 1999). However, reports state that it is unfortunate that around 60% to 80% of the systems fail to meet expectations (Mehlinger, 2006). The ones which were implemented successfully did not show any improvements in performance, leaving the users extremely dissatisfied.

In addition, Lozinsky and Wahl (1998) assert that ERP implementation are globally valid. Nonetheless, an escalating body of evidence points out that the suppositions regarding the way an establishment functions does not reflect reality (Mehlinger, 2006). Most ERP technologies are used for the interaction between faculties and staff members for different activities in the institution. Moreover, ERP systems play an important role in fulfilling all the planned operations at institutions. The 'key success factors' have to be very carefully and constantly checked, those being the factors contributing to the success or failure of the whole process of the system. However, the major aspects under consideration will be monitoring whether the ERP systems are boosting the performance of the user and checking whether all the staff needs are met (Abugabah and Sanzongi, 2010).

2.3 Jordanian Higher Education and ERP systems in Jordanian HEIs

2.3.1 Jordanian Higher Education

As discussed by Alomari (2009) higher education in Jordan can be understood by the fact that over 2.5% of the region's population is enrolled in universities. Higher education accessibility in the region is open to holders of the general secondary education certificate, who then have the choice of selection for private community colleges, public community colleges or private and public universities. Universities in Jordan followed a credit-hour system that is concerned with the entitlement of students to selection courses according to a study plan. In past five years, there is a considerable evolution of higher education systems in the region. However, considering the rapidly growing knowledge base of the economy, lots of efforts are required to upgrade

further the education systems in the country. As reported by Alomari (2009) during the years 2000-2001 and 2006-2007, an increasing demand for high education was witnessed in Jordan where enrolments were growing at a rate of 14% each year (from 77,841 to 218,900 students). So, there is a need for powerful information systems, such as ERP systems, which can meet the needs of stakeholders. Moreover, there has been a rise in the higher education sector in Jordan taking the gross enrolment figures to 40% which is higher than the regional average (i.e. other countries in Middle East). Three new public universities have been established in recent years increasing the total to 10 in the region. In addition, there has also been a rapid rise in the number of private university enrolments as well. During the year 2000 to 2006, there was a growth of 18% in 12 private universities from 36,642 to 55,744 students. Along with the increasing number of enrolments, there is a need for the government of the country to increase the investment and allocate an increasing number of resources to improve the quality of the current system of higher education. Even the private universities are required to bring in a significant level of changes to the policies of admission. The enrolment in the private universities restricts the capability for universities to give priority to measures for increasing the number of students in the higher education institutions. The projection of student enrolment for universities in Jordan is 92,000 per year by 2013 which will have risen from 50,469 per year in 2005.

2.3.2 ERP systems in Jordanian HEIs:

Jordan is in the centre of the Middle East and its population is around 6.316 million. King Abdullah II has a strong belief in the Information and Communication Technology (ICT) sector and it's potential to improve the Kingdom's education systems for the better (MoICT, 2006). This belief is reflected in the "Jordan education initiative project (JEI)", that started in 2003. The project developed a partnership with Cisco systems with the intention of building effective "internet-enabled learning" (Cisco, 2005). Furthermore, huge expenditure and a lot of effort is being put in by the Ministry of Higher Education in Jordan to ensure the successful implementation of ERP systems in the universities of Jordan. Although stakeholders of the Universities in Jordan understand the potential of IT in their education, due to infrastructure related issues, the support for the interactions between stakeholders in the learning process is limited (Alomari, 2009). Although Jordan's education system is expanding rapidly it has not displayed strong movement

(Sabri and El-Refae, 2006). After observing the university sector growth achieved worldwide with the help of ERP systems, Jordan's higher education institutions have now started to respond to the need. ERP systems have offered an alternative approach to Jordan's higher education institutions which has encouraged them their operations. By opting for a new system these institutions get an opportunity to imbibe new information and technologies that increase their communication and thus their performance. It is expected that the demand for ERP systems in Jordan will rise in the coming years (Hinnawi, 2011). The reason for this is the rise in the growth for Internet and mobile users together with the rise in literacy rates. The literacy rates in Jordan is the highest in the region. Owing to the development of new technology in the IT domain it is important for higher education institutions to adapt, redesigning trends in teaching and developing new researchers in the field of education (Diabat, 2011).

The rise in demand from students to change the teaching methods from traditional lectures also pushes higher education institutions to opt for ERP systems that can offer support for online study and e-learning programs. Stakeholders in the higher education community in Jordan have realized the potential of IT and the bright future IT holds therefore they are opting for more opportunities to learn that can help them to develop their skills. Therefore, many institutions in Jordan have implemented ERP systems to meet the rising demands for an increase in the performance as well as the quality of the service provided by the higher education sector.

2.4 Impact of ERP Implementation on HEIs

2.4.1 Organisational Impact

The literature on ERP has mainly focused on those aspects which can either make the ERP implementation successful or a failure, whereas; some of the studies have also highlighted the impact of ERP systems on HEIs. Impact needs an accurate definition to better understand the phenomenon. According to Sedera et al., 2003, the five items which can measure the organisational impact of ERP implementation are costs, human resource requirements, productivity, quality, and business process reengineering. ERP system can be considered as a tool which can reengineer the business processes of an organisation (Koch, 2001; Singla, 2008) so that the maximum efficiency can be achieved among the various departments of an organisation (Miranda and Kavanagh, 2005). Since most of the business processes are reoccurring in an

organisation they can possibly be used in the process of referencing the data and functional model. A reference model, capturing almost 80% of the functionality can significantly save resources in the implementation of an ERP system (Gulledge and Sommer, 2003). If an ERP system is properly aligned with the business processes than it can perform more efficiently and add value for the customer (Gulledge and Sommer, 2003). Continuous upgrades and expensive customization of the ERP software packages are needed to enhance the efficiency through improvements (Lindley et al, 2008). Any public sector organisation has the need to improve its business processes but it cannot be done solely by the adoption of technology. Many interventions are required in the organisational culture to bring about change to the business processes (Harris, 2005). ERP systems not only fail due to complexities in their technical features, but also the cultural and institutional norms of an organisation are also a hurdle to a successful implementation (Harris, 2006). Technology has impacted the management processes, individual behaviour, and the structure of an organisation. IT software and business processes need to be matched and aligned in the right proportions for the creation of a successful configuration (Singla, 2008). Public sector organisations have a large amount of data and information which needs to be correctly managed and this task can be done during the implementation of ERP systems (Singla, 2008). Hence, the competitiveness of the public sector organisations can be enhanced by ERP systems (Allen et al., 2002; Raymond et al., 2005). ERP systems can be helpful in increasing the effectiveness of an organisation by controlling the costs incurred at different steps in the different business operations (Blick et al., 2000).

2.4.2 Individual Impact

DeLone and Mclean (1992) presented a model for measuring the success of an IS implementation in 1992. With this model it was argued that the success of IS depends upon six elements, namely: quality of information, quality of system, use of information, satisfaction of user, individual impact, and organisational impact. This model was updated by the authors in 2003 when the individual and organisational impact was combined in a single variable termed as net benefit (DeLone and McLean 2003). The individual impact can be defined as the effect of the information on the behavior of the information receiver. Similarly, organisational impact is the effect of information on the performance of organisation. A structural model was proposed by Igbaria and

Tan (1997) which was based on the model by DeLone and Mclean. This proposed structural model identified the relationship between IT acceptance and the individual impact. The model defined the individual impact as the influence of IT on the perceived performance of individuals inclusive of their decision-making abilities. Three variables were identified in this model, namely: user satisfaction model, system usage and individual impact. It was found by the authors that the performance of the individual is affected by their acceptance of IT and the individual impact can be attributed to system usage and user satisfaction. It was also observed that the introduction of IT in organisations has enhanced the productivity of individuals as well as their efficiency. The involvement of users positively influences the user satisfaction levels and usage of system by the end users (Baroudi et al. 1986). Sedera et al. (2003) identified: learning; effectiveness in decision making; awareness and recall of skills and productivity, as important for the measurement of individual impact in an ERP implementation. Debates and controversies can be observed in the literature regarding the acceptance and resistance to change in respect of the individual impact on ERP success. According to Hong and Kim (2002), resistance to change by the employess of an organization is one of the critical success factors for ERP implementation and a number of ERP projects have faced that challenge (Aladwani 2001). Causes of resistance include the habits of employees and the risk they perceive in the adoption of ERP systems (Sheth, 1981; Aladwani, 2001; Amoako-Gyampah, 2007). This resistance by the employees gave birth to the challenge of change management in an organisation when introducing the ERP system. Several strategies are needed in respect of change management to make the ERP implementation successful at different phases of the ERP implementation lifecycle (Aladwani, 2001). Organisations introducing the new ERP system should also focus on the internal customers so that any resistance can be traced and addressed in a timely manner (Aladwani, 2001). Whether employees accept or resist the introduction of a new ERP system can be influenced by ease of use, usefulness, involvement and priority usage (Amoako-Gyampah 2007). According to Morton and Hu (2008), if the organisation has a low level of business integration and standardization in the business processes then high levels of resistance can result when implementing an ERP system. The greater the amount of change required to implement the ERP system then the greater amount of resistance

will be witnessed. Lack of awareness of this fact can lower the probability for a successful implementation of ERP systems (Morton and Hu, 2008).

2.5 HEIs benefits from implementation of ERP systems

HEIs who invest largely in these ERP systems find it very tough to identify the actual benefits of the application by evaluating employee performance or the effect of the implementation on the organisation. ERP performance assessment and measures will be discussed in the literature review chapter. Here, a general review is provided for both ERP functionality, which is a direct HEI benefit, and the indirect results or changes brought about by the ERP implementation.

The educational institution functions are not only restricted to imparting education but are also responsible for many other activities like admissions, placements, finance management, library management, etc, so the complexity is increasing. Just like in large corporate organisations, even higher education institutions need systems that manage and integrate their entire operation for the ***smooth running*** of the institution. ERP solutions automate all the processes in an institution, both internal and external. The automated processes will ease communication between all the stakeholders.

The newest product in the market for the implementation of ERP in HEIs is cloud computing technology. Goel et al. (2011) discussed the usage of cloud computing technology for HEIs, which is growing globally and needs suitable management to attain ***global competition***. Depending on the educational institution's size and nature, a choice of ERP implementations is available. As revealed through the research findings, such new technologies are very helpful when there is a considerable ***reduction in cost*** and maintenance, but technical experts are required if constant upgrading is required.

ERP systems result in many changes to the entire functioning of the institution, particularly to the "entrepreneurial character" of universities (Stilwel, 2003 p: 17). The approach towards handling information and user service is changed. This system changes the most fundamental approach to analytics, and staff are transformed to become more efficient. The users of the system must be well trained to ensure a smoothly transition to the new system. The prediction for the future is that as more and more institutes use ERP systems, there will be less paper work required for the management of HEIs.

In addition to functionality, since the turn of the century, because of advances in IT and the adoption of ERP systems HEIs have been getting refurbished. The ERP systems have replaced the old legacy computer software systems at various colleges and universities, to meet the emerging technology demands of the user (Kvavik et al., 2006). The benefits achieved by ERP systems are shown in Table 2.1:

Table 2. 1 Organizational Benefits from Implementation of ERP Systems

Factor	Reason	Benefits
Cost	The usage of the ERP results in lower costs in the long run	The unit cost of the ERP system is lower due to its life span
Technology	More powerful, integrated computer systems	Greater flexibility. Lower IT cost.
Business practices	Better ways of accomplishing tasks	Better operational quality. Greater productivity.
Strategic	Cost advantages gained through more efficient systems	Improve decision making. Support business growth. Build external linkages.
Competitive	Keep up with competitors adopting ERP. Greater cost efficiencies.	Better customer service.

Source: Adapted from Olson (2004)

The implementation of ERP systems carries general benefits for any institution. Much varied research has been done to highlight the benefits of an ERP system for any organisation. According to O'Leary (2000), an ERP system helps to incorporate all business processes and allows access to real time data.

Additionally, Siriginidi (2000) said that for any organisation, there are a lot of indefinable benefits from the implementation of ERP systems. The benefits include enhanced customer satisfaction, better vendor performance, greater than before flexibility, superior information accuracy, and enhanced decision-making ability. O'Leary (2000) lists a few of the benefits in his book as:

- The information system covers all the functional areas and facilitates integration of the complete organisation.
- The performance of core corporate actions increases customer service.
- Information gaps are decreased across an organisation.
- Project management is improved by better clarification.
- The latest technology is introduced.
- Business problems, such as poor control of stock and customer record duplications, are eliminated
- Present business requirements, opportunity for constant improvements, and fine tuning of business processes are all met.

While the benefits of ERP systems are discussed, Udo and Guimares (1994) contend that the chief advantages of ERP systems are that they improve communication between all the participants who are actively involved in the decision-making process. The coordination of the task performed is improved. The results of the decisions are collectively celebrated by the participants, and they feel part of the decision-making process. Even Holsapple and Sena (1999) support the theory that ERP systems help individuals as well as groups in their decision making.

Many benefits exist which are understood by the various users of the education ERP system. Profmax (2011) is a vendor website, well-known for ERP systems which is useful for this research for it contains the latest information and links to many of the latest ERP educational systems. Profmax lists the most important benefits of ERP systems in general as follows.

- Efficiency is much greater through enhanced work flow, and the use of paper is reduced.
- Real time information can be accessed accurately on time.
- The email alerts and controls are tightened automatically.
- The Web-based interfaces are user-friendly.
- The developments and measures are streamlined, so it adopts the best business practices.
- A foundation is established for the latest systems and combines the existing system.

The specific benefits achievable through the implementation of ERP systems in HEIs is shown in Figure 2.2 below.

The benefits stated by the vendor should enable the research to consider the authentic realization of all the benefits in the research sphere.

It is important to note that technical advantage isn't important in the higher education sector since it does not provide the institution, with fast changing needs, with a competitive edge. Porter (1996) has already pointed out that one of the most vital elements for success is proper organizational structure since it has an important role in systematizing, supervising, controlling, and within the organization and offers opportunities to boost flexibility and development in the sector.

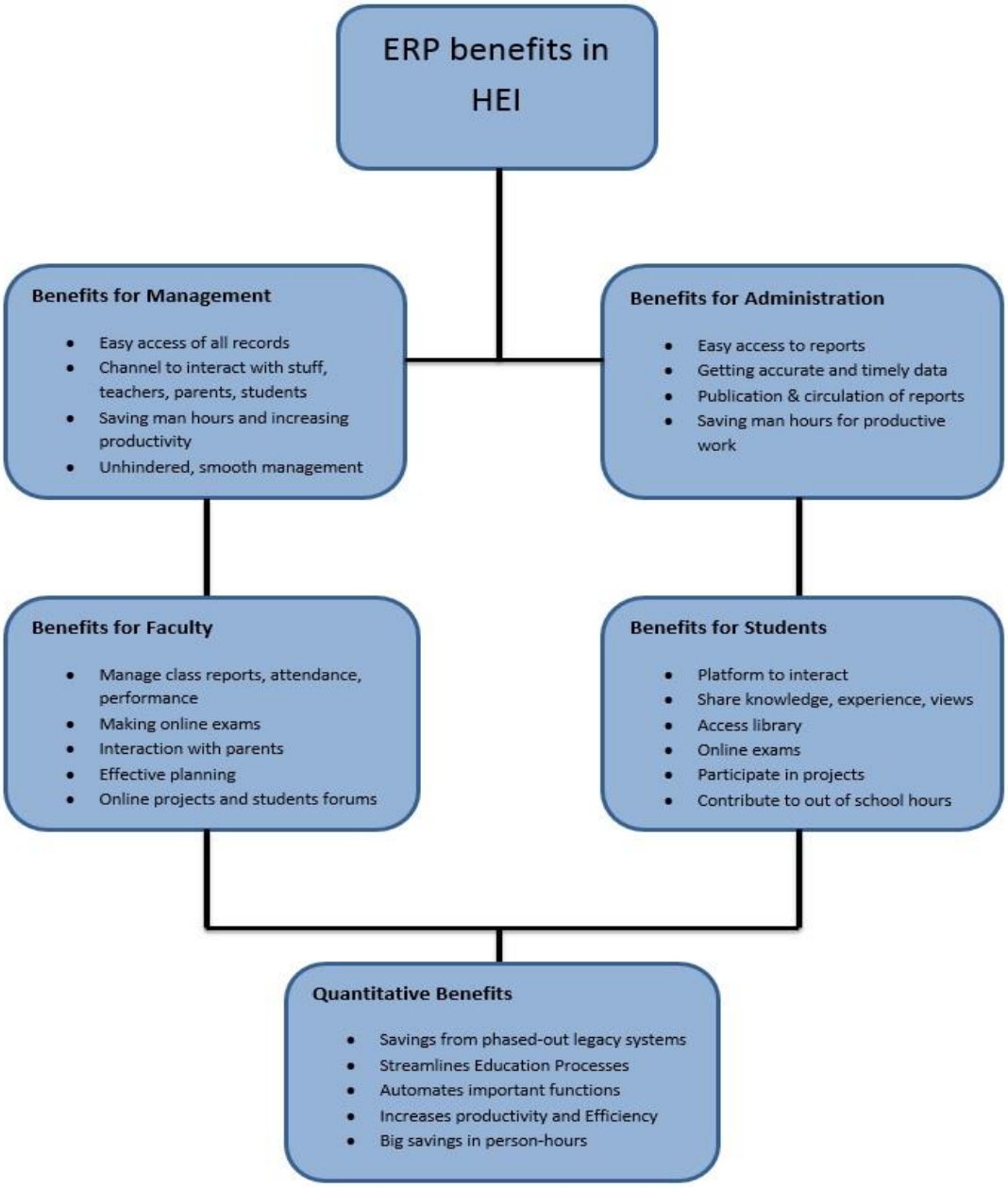

Figure 2. 2 HEIs' Benefits from ERP implementation

Source: Adapted from Profmax (2011)

The different benefits for companies available in the ERP package can be catalogued into five groups (Shanks and Seddon, 2000):

Functional Benefits: Process costs reduced, and productivity increased, administrative Benefits: Proper planning and enhanced decision making, planning Benefits: Support for business growth

and cost leadership building, information technology infrastructure benefits: Reduced cost of technology, and organizational benefits: Assistance for organizational changes and organizational learning.

There are more added benefits apart from the above mentioned. The featured benefits have a varied application in a higher education context. Higher education ERP systems and the integrated internet technologies of the future, hosting services, and extended ERP systems will aid in transforming the operations of higher education institutions in the 21st century. They will progress quickly to realize the purpose of anytime, anywhere computing. An experimental evaluation of the benefits from the ERP implementation in higher education is displayed in table 2.2.

Table 2. 2 Empirical Assessment of the Benefits from ERP Implementation in Higher Education

Description	*Before*	*After*
Reduction in paper forms	N.A.	15,200 fewer forms processed
Duration of monthly closing	10 days	4 days
Duration of semi-annual closing	4.5 months	2 months
Availability of budget reports	Hardcopy monthly	Available online daily
Online access	315 users	1,645 users
Creation of account codes	Manual	Automatic
Alerts	0	16
Approval process	Manual	Electronic
Online requisitions	775	11,400
Paper requisitions	12,973	4,323
Auto created purchase orders	0	11,565
Online receipts	0	6,054
Supply chain forms	N.A.	Eliminated 21 paper forms
Performance metrics	N.A.	Weekly
Policies and procedures	Inconsistent and undocumented	Desktop manuals and online
Days between letter-of-credit draw downs	30	7

Source: (Profmax, 2011)

It is known that success is a multidimensional concept. It comprises more than one technological component. In other words, ERP should be exploited properly to be able to earn noteworthy benefits. These assumptions will lead researchers to eventually understand the utilization of

complex technologies by organisational members, for instance ERP, and the influence of such systems on diverse stakeholders.

2.6 Problems of ERP Implementation

2.6.1 Organisational issues

Different researchers have stated their perspective on the issues of ERP implementation. The case study done by Muscatello et al. (2003) throws light on the most important category for the success of implementing ERP software, which is organisational components. Al-Mashari et al. (2002) also found that if an organisation has clarity in its organisational components, then it will contribute to a successful ERP implementation. Organisational planning of the ERP implementation is very critical, being the success factor for any ERP implementation. One of the major reasons for failure of ERP implementation in HEIs is poor project management (Lawnham, 2001; Brown, 2002; Madden, 2002). Preparation of the project points to an all-inclusive planning stage, where a project team must be formed, and that the team must set the project target, define the project objectives, and plan accordingly. The blueprint phase allows the team to present a business process which has to be analysed in length to make sure a suitable ERP system is selected. The team of people working on the project must be trained in all the functions and configurations for the selected ERP system. This will help them to understand the system thoroughly to be able to reengineer the business processes of the organisation.

The project management needs to address the following issues in the implementation process (Holland et al. 1999).

The ERP software customization should be limited, the budget for implementing the ERP systems needs to be controlled. The ERP systems are not that flexible and there could be difficulty in adapting to a workflow or business process, so most companies have stated this as the major reason behind failure of an implementation. Once the integration sets in, the departments are bonded together with no barrier, so this could be a significant concern for the administrative department with regards to accountability, when the integration happens, many departments will be reluctant to share their details, so the software will not perform effectively and will succumb to less benefits.

If the ERP systems are carefully selected and implemented correctly, the contribution will be positive in resolving business issues. Not only should the ERP system be implemented correctly but it must also be maintained and upgraded at proper intervals according to the changing requirements of the end user. Figure 2.3 below shows a checklist of main errors which must be avoided during an ERP implementation (Bryan, 1999):

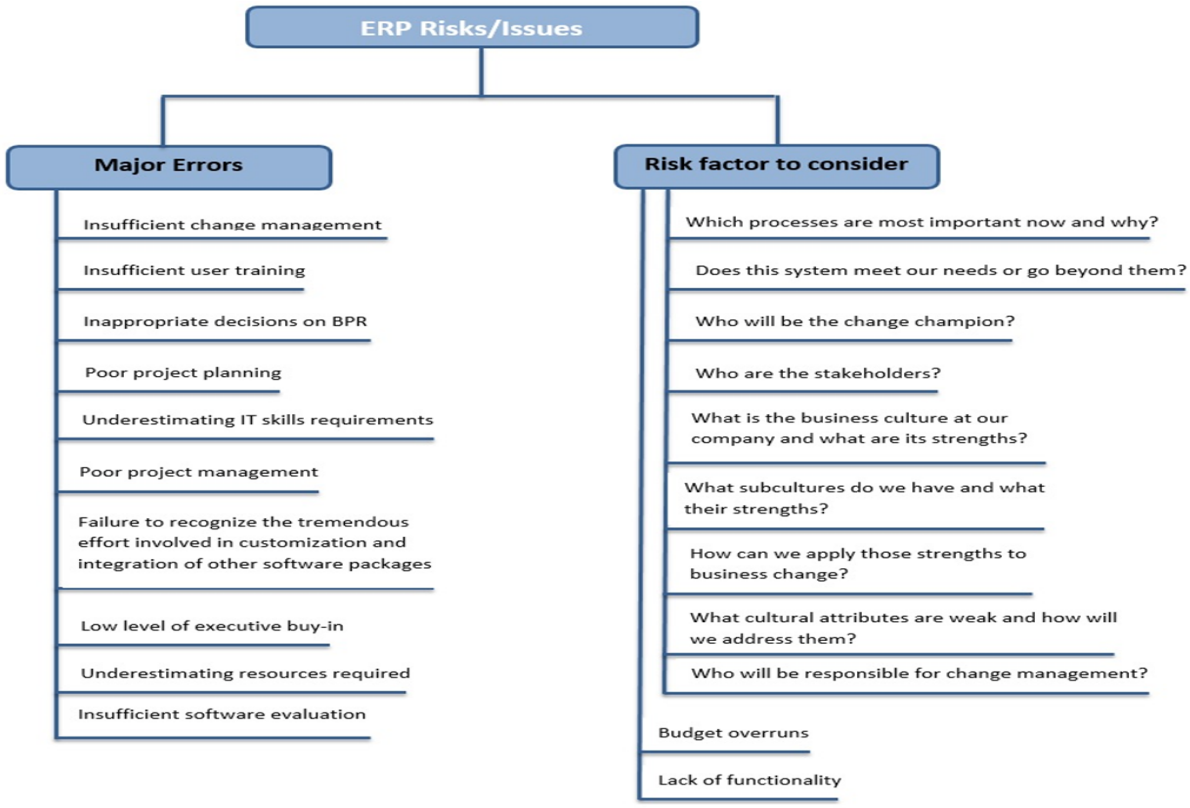

Figure 2. 3 ERP Risks and Issues

Top management often faces a problem during the implementation phase of an ERP implementation due to resistance from end users who do not want to follow the new procedures. Hence, it is imperative that the management prepares the users so that resistance is low, and everyone concerned embraces the change in a positive manner.

In fact, Beheshti (2006) noted that several industries face problems in the implementation stage because often they are unaware or unprepared for the complexity of the system. People do not have any experience with an ERP system and so face problems with the actual process of change. Moreover, this type of implementation is costly and only half of ERP projects manage to realize

their promised advantages. Problems occur due to the ignorance of management who significantly miscalculate the exertions required to incorporate the change.

Dover (2012) further stated that if employees are sufficiently trained then they should benefit from the change but often employees are not ready to adapt which can result in the failure of the ERP implementation. Hence, establishments should keep in mind that implementation represents much more than simply an incremental alteration. The changes occur in the technical infrastructure, corporal procedure, administrative implementation, responsibilities and expertise of managerial members, and the understanding of the administration required. Accordingly, entire alterations in all these domains are needed for successful realization of the benefits of the application.

2.6.2 Technical issues

The technical teams in the information technology department must take responsibility for providing the requirements for a good infrastructure since it affects all the important functions of the chief departments in the organisation (Mabert et al., 2001). It is argued that in an ERP implementation, the prime trouble isn't the technical challenges but the allied organisational management (Davenport, 1998; Schneider, 1999; Caldas and Thomaz, 1998). As the researcher discussed in the previous section. Even though ERP implementation can supply organizations with plentiful benefits, the implementation process needs to be properly administered to realize success. Furthermore, during the implementation, it is mandatory to give appropriate importance for the continuing maintenance and the preparation of an appropriate IT infrastructure for the system, so that the result, as well as the production of good information, will be a high-quality ERP system. Salmeron and Lopez (2010) further stated that another essential factor to take into consideration the key users, as it is these users who are involved in the maintenance task, hence, it is essential to build a link between the end users and the ERP support staff. Another requirement for good maintenance support is that the charges for everyday routine work should be kept at a minimum while affording a high amount of flexibility. Therefore, the management should select a vendor that provides long term support and maintenance at an agreed cost and duration.

However, when the needs of the organization change, it can be necessary to upgrade the system. Consequently, this upgrade could require vast alterations in the functionality and structure of procedures for the system costing a lot of effort and money for the management. Hence, the management should only undergo an upgrade if there is a need for that functionality in the organization. The purpose of an upgrade is that the company should work in an improved and efficient manner and all the earlier functions will be running properly in this latest version (Beatty and Williams, 2006). However, sometimes an upgrade is required because of a critical change to government policy and not because of any management needs in the organization so the process of upgrading must be executed quite sensitively (Ng et al., 2002).

2.7 Chapter summary

A comprehensive literature review of the ERP implementation in the HEI context was undertaken to ascertain the various facets that needed to be studied. This research concludes that ERP is not efficient as a standalone application. Most ERP providers have various functionalities that adapt better to industrial rather than academic environments. ERP systems should be thoroughly suited to fit the academic institution's requirements and the implementation process should start with implementing the organizational structure which includes the strategy, policy, data flow, business process structure, and appropriate functionality to achieve success.

The benefits and impacts provided by an ERP system need vital consideration. Most of the researches conducted cover the social factors and the effects on the individual but do not consider technical and implementation issues. This outcome must be approached in a different manner to successfully deliver the implementation of a system which will be beneficial to any HEI. It has been shown conclusively that issues in organisational components, insufficient technical issues, or difficulties with the end user, were the most cited issues which acted against the success of an ERP implementation.

CHAPTER 3 LITERATURE REVIEW

3.0 Chapter Overview

To investigate the research issues extracted from Chapter Two. This chapter reviews and critically discusses the literature related to ERP implementation. The aim of this chapter is to identify the factors that lead to the successful implementation of an ERP system. Based on the information highlighted by the literature review, a conceptual framework will be developed as a theoretical underpinning for this research.

This review will analyse the literature of three models of information system (IS) implementation. The three models are the DeLone and McLean IS success model proposed by DeLone and McLean (1992), Critical Success and Risk Factor Theory, and the Process Model. The researcher will then be integrating these models to produce a new model that offers a comprehensive view of the factors that can be used to identify the effectiveness of ERP systems in the field of higher education.

For each model, the background and relationship with ERP, the benefits and limitations of the models and the implications of these according to academicians and researchers will be discussed. Then the research gaps in the literature relating to the factors for a successful implementation of ERP will be identified and analysed.

Further, in the following chapter, the identified factors taken from extant literature will be referred for coding themes and KSFs.

3.1 Literature Search: Principles and Process

The literature review is not limited to presenting a short summary along with the listing of references but moves beyond to conduct a critical analysis of the text read and references. The importance of the literature review is depicted in Table 3.1 as provided by Wallace and Wray (2006).

Table 3. 1 Critical Review of the Literature

Project	Rationale	Typical Question
Understanding	Understand through theory and research	What happens and why?
Critiquing	Critique through theory and research	What is wrong with what happens?
Evaluating	Inform practice and policy through research and evaluation	How effective are actions to improve policy/practice?
Improving	Improve practice through interventions, training and/or consultancy	How may this intervention improve practice?
Reflecting	Reflect on own management practice through evaluation and action	How effective is my practice? How may I improve?

Source: Adapted from Wallace and Wray 2006

Difficulty in the implementation and the high rate of failure in implementing ERP systems emphasizes the need and reinforces the importance for understanding the factors associated with a successful implementation of the ERP system. Also, it is noteworthy that despite the promised improvement in management and the functioning of business organizations, improperly implemented ERP systems can not only result in high rates of failure but can also bring about inaccuracies in work posing a high degree of risk for organizational growth. There are some major reasons for such a failure including: unclear definition of strategic goals; lack of participation of senior management in the implementation; underestimation of the scope, size, and complexity of the project; lack of preparedness of HEI for the integration of information; improper selection of team members; inappropriate training and education of staff members,

lack of transparency in communication, and lack of efficiency in system measures to allow the change. The literature review presented information from many articles, journals, and databases answering the question, “what the key factors for ERP implementation success”. To answer to this question, it was necessary that the existing academic and industry literature be properly read, synthesized, and analysed to critically examine the findings.

The literature search was conducted through a meta-approach utilizing databases (see Table 3.2) and journals (see Table 3.3) to find information for the research subject, while using a different set of search terms (see Table 3.4), made up from relevant keywords to ensure the reliability and validity of the review. The main databases include: Science Direct; Emerald; Education Resources Information Centre; Social Sciences Database and ProQuest Computing. The search terms and the conditions outlined were used as the basis for selection of the articles from the search results in table 3.4. The search results were limited those obtained from scholarly or peer reviewed journals. The researcher made the decision for the selection of journal articles after reading and understanding the papers. Only those articles which answered the research questions relating to the implementation of ERP systems were included.

Table 3. 2 Databases Used for this Research

Database
Science Direct
Emerald
Education Resources Information Centre
Social Sciences Database
ProQuest Computing

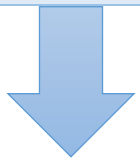

Table 3. 3 MIS Journals Used for this Research

Journals
Management Information Systems Quarterly
Information Systems Research
Management Science
European Journal of Info. Systems
Journal of AIS
Journal of Computer Info. Systems
Information and Management
Decision Science

Apart from the previously mentioned databases, others were studied that contained journal papers belonging to the business or IS domain. Table 3.4 presents the keywords used to search the results for the research topic. In fact, most of the keywords used to search were taken from the relevant articles reviewed during the literature review process. Only scholarly or peer-reviewed articles in the search results were chosen for this study.

Table 3. 4 Search Terms- Journals and Databases

Searched: Abstract and Title	
Journal searches	**Database searches**
Key success factors ERP implementation	Key success factors ERP implementation
ERP implementation AND success OR success	ERP implementation AND success OR success
ERP implementation for higher education	ERP implementation for higher education
ERP Systems in Jordan	ERP Systems in Jordan
ERP success	ERP success

Enterprise resource planning	Enterprise resource planning
Key success factors enterprise systems	Key success factors enterprise systems

3.2 Key Success Factors (KSFs)

3.2.1 Concept and Category of Key Success Factors (KSFs)

As per the words of Digman (1990; p:247), “the key success factors are the areas where things must go right for the business to be improved”. Similarly, Okland (1999; p:325), has defined KSFs as “what the organisation must accomplish to achieve the mission by examination and categorization of the impacts”. Two key points, area and scope, can be identified from these KSFs. Yu (2005), has identified that majority of the literature on ERP systems have focused on two domains, namely: evaluation of suitable ERP system software vendors and the key success factors that affect the successful implementation of the ERP system. These factors include the selection of the ERP team, support of top management, communication to stakeholders, business strategy and plan, business type, project management and legacy system. Implementation of ERP system is an extensive project, therefore, before the actual implementation, organisations need to understand the competencies and abilities of their employees. They need this understanding so that they can use and maintain the system more effectively and take maximum advantage of any innovations and developments (Bendoly and Schoenherr, 2005) that are available to them. Proper assessment of the changes that are required within the organisation before the actual implementation of ERP processes takes place. This assessment can bring improvements to the supply chain procedures and help the organisation to achieve a competitive advantage in the marketplace. Literature has identified that the implementation of ERP systems is a critical issue for higher education institutions (Moon, 2007). Some of the key success factors highlighted by Nah and Lau (2001) include proper control over: the ERP project implementation team, business plan, project management, change management, business process reengineering, communication, top management support, software development, customization, monitoring and evaluation, and testing or troubleshooting, for the successful implementation of ERP system in an organisation.

The categorization of these ERP success factors enables the managers and I.T team to have a better understanding and opportunity for tracing problems and subsequently solving the issues. For maximum utilization of the ERP systems, because different levels of management perceive success in different terms they can each have their own category of KSF's. Review of the related literature has identified a variety of categories and their associated factors. Holland and Wright (1999) categorized implementation success factors into strategic and tactical (Holland and Light, 1999). On the other hand, Esteves and Pastor (2000), used organisational and technological as the key factors. A framework presented by Son et al. (2005) identified management, process, technology, data, and people as the key success factors. A combined model of ERP presented by King and Burgess (2006), showed cycle of developmental operations, support, organisation, and project as the key factors which determined success or failure. Section 3.2 has highlighted several factors which have been stressed frequently in the literature. These factors are helpful because they offer a better understanding about the processes within the ERP implementation lifecycle. Sufficient evidence from the literature helped the researcher to shortlist the most important KSFs for the development of ERP implementation model for HEIs. The current research has identified that success is not dependent upon a single factor but in fact requires a combination of several KSFs. Eleven key success factors have been identified by the researcher from the review of the literature. These factors are shown in table 3.5 below. The researcher considered the frequency that factors were discussed in the literature and only those factors which were supported by empirical evidence were selected for the development of a conceptual model. The most important role played by the information system is the provision of support for the business processes, decision making, and identifying the competitive advantage for the organisation which will come from the tangible benefits achieved. Any system must pass through standards of feasibility and appraisal before the final adoption and implementation decision (O'Brien and Marakas, 2007). The analysis of the ERP implementation in HEIs has taken ERP implementation as a project which has the same constraints as any project, which are time, budget and quality. These conditional constraints are the iron triangle of project management (Dezdar and Sulaiman, 2009).

Table 3. 5 Examples KSFs investigated in studies of ERP systems in the literature

Key Success Factors	Search results in number of articles	Cited by
Change Management	**28**	(Bingi *et al.*, 1999), (Pawlowsiki and Boudreau, 1999) (Kim *et al.,* 2005). (Ehie and Madsen, 2005). Bingi *et al.* (1999) (Umble *et al.*, 2003). (Grabski and Leech, 2007). (Ash and Burn, 2003). Hawking *et al.* (2004) (Motwani *et al.*, 2005). Wee (2000) (Sumner, 1999) (Shanks et al., 2000) (Falkowski et al., 1998) (Rosario, 2000) s (Murray & Coffin, 2001). Holland et al. (1999) (Amoako-Gyampah, 1999; Russo et al., 1999; Sarker and Sarker, 2000).
Training and Education	**21**	Bingi *et al.*, 1999), (Pawlowsiki and Boudreau, 1999) Bender *et al.* (2000) (Rosario, 2000; Wee, 2000; Al-Mashari *et al.*, 2003) Siriginidi, 2000a, b; Somers and Nelson, 2001, 2004; Nah *et al.*, 2001, Palaniswamy and Frank, 2002, Mabert *et al.*, 2003, Shanks and Parr, 2000) (Shehab et al. 2004) (Boehm, 1991) (Murray & Coffin, 2001; Shanks et al., 2000) (Sumner, 1999) (Dong, 2001)
Business Process Re-Engineering	**21**	Shehab *et al.*, (2004) (Holland and Light, 1999; Bingi *et al.*, 1999; Hong and Kim, 2002; Yusuf *et al.*, 2004) (Shanks *et al*. 2000; Light, 2001; Bajwa et al. 2004) (Siriginidi, 2000a, b; Somers and Nelson, 2001, 2004; Nah *et al.*, 2001, Palaniswamy and Frank, 2002, Mabert *et al.*, 2003, Shanks and Parr, 2000) (Shehab et al. 2004)
Organisation Culture	**16**	(Falkowski et al., 1998), (Rosario, 2000). (Roberts and Barrar, 1992) (Bingi et al., 1999; Holland et al., 1999). (Roberts and Barrar, 1992) (Sumner, 1999). (Schein, 1983) (Sackmann, 1992) (Kayworth, T. and Leidner, D., 2004)
IT Infrastructure	**18**	(O'Leary 2004) (Klaus et al., 2000) (Becker, 2000; Zhao et al., 2002), Beynon-Davis and Williams (2003), Jacobson et al. (1999) Webster (1986) Dixon et al. (1990) Pollock and Cornford (2004) Bradley and Lee (2007) Irani (1998).
Information Quality	**19**	(Chun-Chin Wei, 2008) Sakris and Sundarraj (2000) (Seddon and Kiew, 1994; Ballantine et al., 1996., Myers, Kappelman, and Prybutok, 1997; Seddon, 1997) Petter (2008) Sedera and Gable's (2004) Darmawan (2001) Bernroider (2008) Rabaa'i and Gable (2009)
System Quality	**14**	(Rockart, 1978) Chien and Tsaur (2007) Petter et al., 2008; Abougabah et al., 2009; DeLone & McLean, 2003; Sedera and Gable, 2003; Sedera and Gable, 2004; Zhang et al., 2005; Ifinedo and Nahar, 2006; Calisir and Calisir, 2004; Chin and Tsaur, 2007)
Project Management	**28**	(Umble et al., 2003; Nah and Delgado, 2006) Kim *et al.* (2005) (Botta-Genoulaz *et al.*, 2005; Taube and Gargeya, 2005). (Bingi *et al.*, 1999). Maber *et al.,* (2001) (Scott and Vessey, 2002) (Holland *et al.*, 1999) (Laughlin, 1999). (Umble *et al.*, 2003; Al-Mashari *et al.*, 2003; Bajwa *et al.*, 2004) (Rosario, 2000), Bender *et al.* (2000) (Rosario, 2000; Wee, 2000; Al-Mashari *et al.*, 2003)

		(Boehm, 1991) (Murray & Coffin, 2001; Shanks et al., 2000) (Sumner, 1999) (Dong, 2001)
Budget	**18**	Mashari et al., 2003; Bajwa et al., 2004) (Rosario, 2000), Bender et al. (2000) (Rosario, 2000; Wee, 2000; Al-Mashari et al., 2003) (Boehm, 1991) (Murray & Coffin, 2001; Shanks et al., 2000) (Sumner, 1999) (Dong, 2001) (Holland and Light, 1999; Bingi et al., 1999; Hong and Kim, 2002; Yusuf et al., 2004) (Shanks et al. 2000; Light, 2001; Bajwa et al. 2004)
Time	**17**	Umble et al., 2003; Nah and Delgado, 2006) Kim et al. (2005) (Botta-Genoulaz et al., 2005; Taube and Gargeya, 2005). (Bingi et al., 1999). Maber et al., (2001) (Scott and Vessey, 2002) (Holland et al., 1999) (Laughlin, 1999) Siriginidi, 2000a, b; Somers and Nelson, 2001, 2004; Nah *et al*., 2001, Palaniswamy and Frank, 2002, Mabert *et al*., 2003, Shanks and Parr, 2000).
Top Management Commitment and support	**28**	Wu and Wang, 2007; Calisira and Calisir, 2004; Aladwani, 2003; Kelly et al., 2001; Mahmood, 2000; Doll et al; 2004; Norman et al., 2002; Somers et al., 2003) (Hsu et al., 2008). Chien and Hu (2009) (Au et al., 2002). Somers et al., 2003; Au et al., 2008; Zviran, 2003; Mohmood et al., 2000; 2002; Hsu et al., 2008) Rabaa`I, Bandara and Gable 2009). (Adelakun and Jennex, 2002).

All the factors listed above have been identified from literature and have been categorised based on the works of Sun et al. (2005). There are two criteria in this work used for the categorizing the KSFs. One is the perspective of multiple parties, which includes the technical and organizational parties, the other is the ERP implementation perspective, which includes the project and support system (see Figure 3.1). The researcher has highlighted the frequency of the factors that have been discussed and utilised in the literature. They were selected based on the frequency they were discussed in the literature and their importance to ERP success. They play an important part in the ERP implementation process and are broad in scope covering organisations in different industrial sectors. They also provide sufficient support for the researcher to identify the most important factors for developing an ERP implementation model for HEIs.

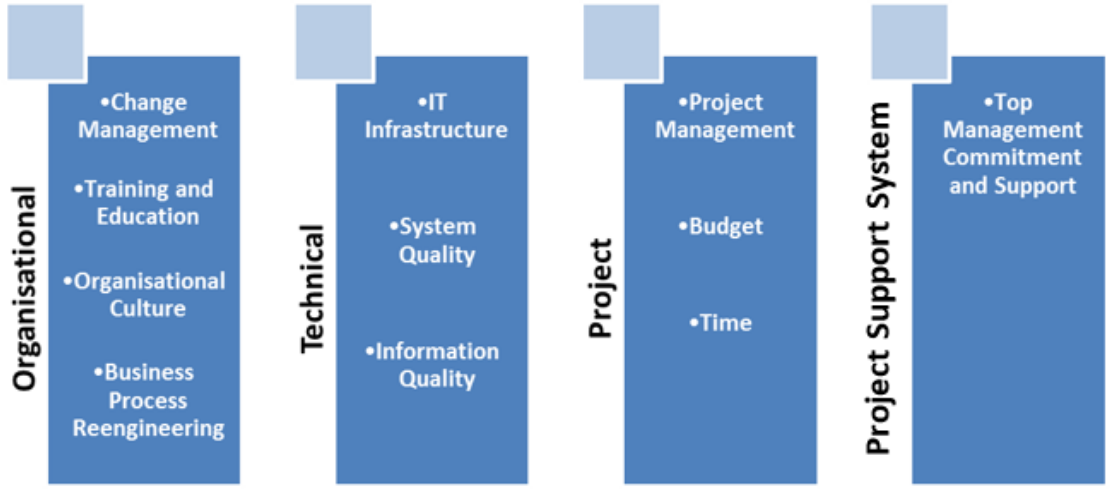

Figure 3. 1 The top cited KSFs

Source: The researcher

All four perspectives have to be taken into account when selecting and implementing ERP as each of these views impact differently, but equally, on the ERP system implementation. If they are not all integrated into one level, the implementation will not be successful and will not be able to fulfil the perceived benefits.

3.2.2 Organisational factors

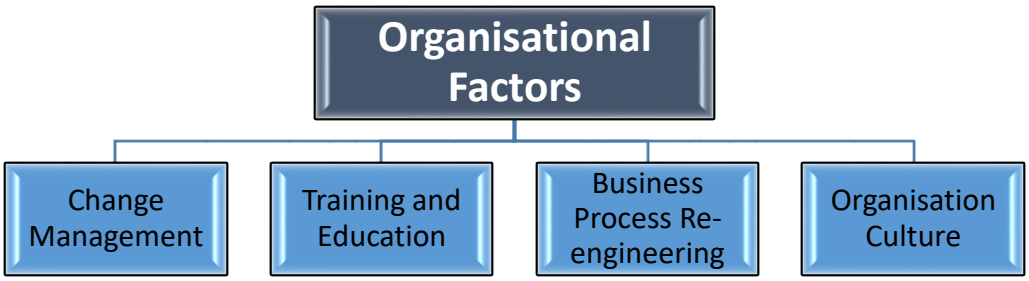

Figure 3. 2 Organisational Factors

Source: The researcher

Interesting developments were observed when many researchers included generic KSFs for information technology and organisational factors as important in the implementation process. Trimmer et al. (2002) mentioned generic KSFs on the basis of previous review. The researcher categorised four factors that affect organisational performance based on the ranked order of successful ERP implementation studies, change management (which is frequently underestimated and given less time due to schedule pressures) and limited understanding of cross-functional business processes *(Malbert et al., 2003; 2002; Umble et al., 2003; Bingi et al., 1999; Al Ang et al., 1994, 1995, 2002; Cox & Clark, 1984; Sum et al., 1997; Yusuf et al., 2004*). Furthermore, when implementing an ERP system, there is a need to recognize the unique Arab cultural context because the existing business models typically reflect Western practices (*Mashari et al., 2003; Motwani et al., 2002*). In addition, the need for business process change from the legacy systems to the new ERP system during the implementation of an ERP system should be recognised (*Mandal & Gunasekaran, 2002; Bingi et al., 1999; Al-Mashari et al., 2003; Yusuf et al., 2004; Burns and Turnipseed, 1991*). However, the data and details used were compiled on the basis of the researcher's own case studies. Similarly, Davison (2002) conducted research considering the case of how the culture impacted the success of the implementation at Hong Kong University. Abdinnour-Helm et al. (2003) worked on employee attitude and its impact on the success of ERP implementation. Many other perspectives were also considered by academics. Tarafdar and Roy (2003) considered issues related to the acceptance of the system in the organisation interviewing executives during their study. Robey et al. (2002) with the help of a case study, emphasized issues related to knowledge barriers. Dong (2001) recognized the

importance of the assistance of senior level management in achieving a successful implementation.

- **Change management**

Change management is defined as "the process, tools, and techniques to manage the people side of change to achieve a required business outcome" (Al-nafjan and Al-Mudimigh, 2011 p: 4). Change management is cited most often as a KSF in ERP implementation. For the successful implementation of a project, it is necessary to be aware of the implications of changes and managing them in a formal manner (*Bingi et al., 1999)*. Among various ERP systems implemented, there are around 50% that failed to achieve the expected benefits. A major reason for this failures was the failure by the manager responsible to recognize the effort required to ensure proper management of change (Umble et al., 2003).

In the absence of an approach supporting the process of change, it becomes impossible to implement an ERP system and bring in any transformation within the organization (Al-Mashari & Zairi, 2000). Therefore, strategies that manage change are important for the implementation and deployment of ERP systems within organisations to achieve the expected output (Kim *et al.,* 2005). Motwani *et al.* (2000) compared successful and failed ERP systems and found that a project that has senior management support but does not have the right degree of organisational readiness has a high chance of failure. To achieve a greater degree of success the team responsible for the implementation of an ERP system needs to contain the best employees from the organisation (Siau & Messersmith, 2003).

The changes associated with implementation may lead to user resistance and uncertainty (Kim et al. 2009). As well as resistance, this may also lead to high employee turnover (Grabski & Leech, 2007). Therefore, the successful implementation of an ERP system is highly dependent on handling conflicts between the organisation and technology and the effective management of the employees in the process of change (Ash & Burn, 2003). As such, Hawking *et al.* (2004) explained that the ERP system implementation was a project focused on people and if it was to be successful, was highly dependent on those people accepting the change. Therefore, the flexibility of an organisation and its ability to accept change, especially when associated with new

technology will greatly assist in the implementation process. If the senior level management is able to pass on the vision to its employees while ensuring that employees are familiar and satisfied with the changes and motivated enough to follow the rules and regulations of the new system, then the ERP system should be successfully implemented (Motwani *et al.*, 2005).

- **Training and Education**

It has been stressed in a number of research studies that training should be included as an influential and key factor in the implementation of ERP systems. Although some researchers have discussed the need for general training for the whole organisation a large number of the researchers emphasized the need for specialised training for users of ERP systems (Bingi et al., 1999; Kumar et al., 2002; Robey et al., 2002; Mandal and Gunasekaran, 2003). Some of the researchers argued that training related to ERP systems should be part of IT skills development (Stratman and Roth, 2002; Voordijk et al., 2003; Tarafdar and Roy, 2003) and that this training should be easily available (Aladwani, 2001).

There is a need for appropriate education and training for the users of a new system and this training should be provided by the organization to help the users understand the functionality and to maximize the incorporation of the system during routine operations (Bajwa et al., 2004). Online printed user manuals, easy tutorials, frequent workshops and efficient help desks should be provided to the users to ensure their understanding and trust, two other important factors for the implementation of ERP systems within organizations. It was observed that end-user training was considered of low importance because training was expensive on resources (Gargeya and Brady, 2005). It can also be concluded that although using up precious resources of money or time can impact on short term gains it can also enhance long term profits. On the other hand, non-provision of such resources can increase short term gains but ignorance of the system functionality by users can lead to operational disasters and long term failure.

- **Business Process Re-Engineering (BPR)**

As explained by Hollan and Light (1999), the implementation of any ERP system calls for some form of business process reengineering. Such a need arises as organizational technical processes are adapted and designed to match the capabilities of the ERP software. Moreover, ERP systems are implemented in an organization-wide manner where several different stakeholders are

involved, located in locations that are geographically dispersed in nature. Here the need is to standardize the data and integrate the system with other IS while managing the needs and expectations of various vendors and consultants (Son, Kien, & Tay-Yap, 2000). Under such a business scenario, there are certain key management challenges faced by traditional projects resulting in a difficult and expensive process of ERP implementation (Markus, Tanis, & Van, 2000). Therefore, it should be realized that the successful results achieved in the implementation of other technology might not prove to be applicable and successful in the implementation of ERP.

Business process reengineering is the process appearing at the very first stage of an ERP implementation. Reengineering is the process followed by an organization that demands radical redesigning of business processes for the achievement of increased efficiency, higher quality, and more competitive operations (Hammer & Champy, 1993). Here it is to be noted that under the configuration process of an ERP system, there lies an iterative reengineering of business processes in order to achieve the benefits provided by the new system. Under such a scenario, organizations are required to be prepared to recognize the entrenched benchmarks and redesign their core systems and processes accordingly. In order to achieve the expected advantages of the ERP system, as it becomes operational, the existing processes in the educational institution must be reengineered incorporating more up-to-date methods and updating procedures accordingly. Murray and Coffin (2001) explained that organizations should prepare to transform their basic processes of business so that all the areas become compatible with the new ERP system. However, some other scholars like Nah et al. (2003) and Rosario (2000) are of the view that there is a need for only modest personalization of the software which helps in preventing inaccuracies but makes it easier to update with the latest editions of the software with only a small amount of re-introduction of changes.

It is to be noted that reengineering of business processes is a key component of ERP system implementation where it needs to be ensured that the basic culture and environment of the organization is not disrupted. Therefore, strong support from key stakeholders becomes necessary to ensure the smooth implementation of the ERP system in any educational institution.

The views of various scholars discussed above highlights that ERP can be considered to be an exclusive instance of implementing information technology where changes in the processes of

business becomes the key to acquire the best outcomes from an ERP implementation. The views of scholars also explain the importance of business process reengineering in the implementation of an ERP system. However, Law and Ngai (2007) are of the view that the understanding of business processes that organizations aspire to establish, should be well recognised, to achieve the benefits of ERP implementation in a practical manner. Therefore, it is clear that successful implementation of ERP systems is strongly influenced by the business process reengineering methods and approaches adopted by HEIs.

- **Organization Culture**

Organization culture is one of the most important key factors in the ERP implementation success. "Organization culture is a set of shared assumptions and understanding about organization functioning" (Deshpande & Webster, 1989). It is assumed that the goal is for the employees to do more work but for them to work more effectively (Hassanali, 2002). Organizational culture is developed more effectively if there is collaboration between the people in an organization. The employees should be encouraged with incentives and an effective reward system, so that they share their knowledge more effectively. Top management implement such a system and deliver rewards to the people concerned when their excellent performance ensures the success of the organization. These motivations are very important and will lead the organization through competitive challenges if they participate and share their tacit knowledge during ERP implementation. The responsibility of management is not limited to the reward system for culture development. It will be extended further to provide a friendly environment and try to completely eradicate the difficulties that arise for the employees by providing all the resources required for ERP implementation. Moreover, the culture of an organization will be more developed if the collaboration between employees is effective. In other words, the sharing of knowledge among employees and a place where each employee can work in a friendly environment will enable them to obtain all the benefits of a successful ERP implementation.

There are several ways in which HEIs can implement and adapt ERP systems, however, most HEIs are not aware of the risks and challenges involved. They are aware of the merits associated with the integration of various business functions, representing a well-integrated system for administering students and managing human resources and financial systems, but need to

recognize the fact that “the value is not in the system, but in what you change” (Millman, 2004). It is important to consider the value of an integrated database that can be shared by different functions of the business bringing along the synergies of different business modules under a single integral information solution (Olson et al., 2005). Also, HEIs need to consider the impact of cultural differences when implementing an ERP system ensuring that it is not considered to be just another project but as a unique system of implementation in its own right.

3.2.3 Technical factors

Considering the ERP system from the technical perspective as well as just the client and organisational perspectives is necessary to achieve a successful implementation. In the next section the researcher will explain the significance of measuring the achievements of ERP from a technical perspective. Figure 3.3 shows the technical factors adapted from the meta-analysis of the literature.

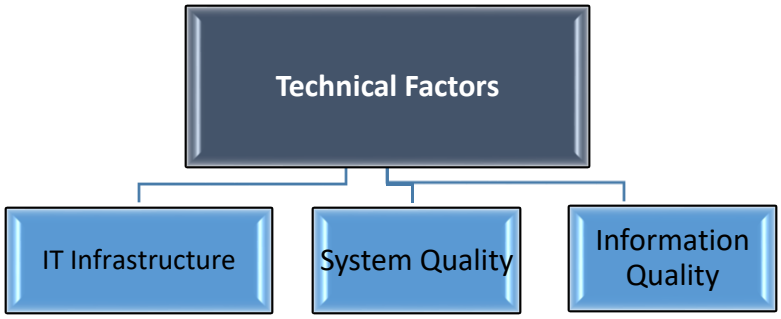

Figure 3. 3 Technical Factors

Source: The Researcher

- **IT Infrastructure**

The infrastructure of the information technology department is an important part of a HEI as it helps in developing a platform for the IT/IS (Shaw, 2000; Kamal, 2008). The infrastructure of the IT department is comprised of the relevant software, hardware and technical staff required to develop and operate IT applications, and it is necessary to have the appropriate infrastructure to ensure the proper implementation of any ERP system. As Jarrar et al. (2000) argued, the configuration of software together with the infrastructure is necessary to ensure an efficient implementation of the processes. At the same time, it is required that educational institutions consider ERP as a holistic business undertaking and not limit its implementation to a large scale project associated with information technology. Furthermore, Ehie and Madsen (2005) asserted

that ERP should be considered as a business solution and not limit its scope to being just an IT solution where the standardization of the IT infrastructure ensures the successful implementation and application of the ERP system. Therefore, it can be said that in order to implement an ERP system in an educational institution, there is a need to ensure the availability of an efficient IT infrastructure.

- **System Quality**

The quality of the system is associated with the features of functioning and performance associated with the ERP implementation. Ifinedo and Nahar (2007) explained that the quality of the system is associated with the issues concerning the facilitation, exploitation, and procurement of knowledge for the reliability and effectiveness of the system. In the context of the IS discipline, the quality of the information system is considered to have a wider scope in comparison to the areas of the IT sector (Andersson & Hellens, 1997). The system of ERP is integrated in nature, it can be considered to be a "one-system-only information and knowledge system" making it important for the successful operation of a business organization. Here the quality of the system is necessary to ensure the beneficial exploitation of the IS giving rise to a competitive edge (Earl, 1990). Therefore, system quality is a key factor ensuring and influencing the implementation of ERP in an efficient manner.

- **Information Quality**

The focus of this particular factor depends on the quality of the information derived from the information systems. Information quality can be defined as inherent or pragmatic. Inherent quality is where the focus is on the accuracy of the information and pragmatic quality is where the focus is on the value of the data to support the organizational work and operations. If the data or information fails to assist an organization in accomplishing its vision and mission it is considered to be lacking in quality. Some scholars like Ifinedo and Nahar (2007) explained that information quality is associated with its relevance, ability to be understood, accessibility, and usability in providing productive data for the system. In relation to ERP quality is related to the value of the data obtained from the system. An ERP for an educational institution is required to support every organizational process, including: campus management for students and academic services as an educational administration system; student procurement and lifecycle

management; analytics; research; and asset management. It is necessary that a suitable knowledge base is built while using any ERP model as such an implementation calls for the large-scale integration of information for staff and students.

The key significance of the ERP system is associated with its capability to restructure the flow of information across the institution. Therefore, the quality of information is a key factor influencing the successful implementation of an ERP system for HEIs.

3.2.4 Project Factors

The fundamental role of any information system is to support the business operations, managerial decision making and create a competitive advantage through tangible benefits. Thus, any system before the final adoption decision, passes through feasibility and appraisal as a project (O'Brien and Marakas, 2007). This analysis focuses on ERP as a successful project within the usual conditional project management constraints of 'time, budget and quality' - the Iron triangle of projects management (Dezdar and Sulaiman, 2009). There follows three relevant project category sub-factors explained in figure 3.4.

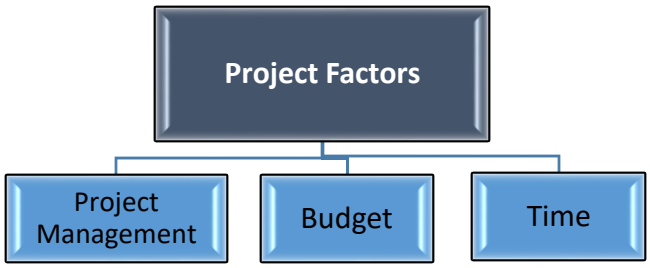

Figure 3. 4 Project Factors

Source: The Researcher

- **Project management**

As per the definition available from APM (Association for Project Management), management of the project through the process of ERP implementation refers to the "application of processes, methods, knowledge, skills, and experience to achieve the project objectives." Comparatively, ERP implementation is successful if the project has cautious, evolutionary, and bureaucratic implementation with the support of careful change management, networking of relationships, and cultural readiness (Amoako, 2018). ERP system implementation is not limited to changes in the software or hardware system but has the potential to provide an organization with greater

performance standards by restructuring the process of business (Ehie & Madsen, 2005). Eventually, the implementation of an ERP system changes the way a firm currently conducts business and needs to re-engineer, or develop new, crucial business processes to achieve organisational goals (Badewi, 2016; Umble et al., 2003).

On the other hand, most of the available literature considers support and assistance from higher-level management as the key factor for successful ERP implementation. Davenport (1998 p: 32) mentioned that "if the development of an enterprise system is not carefully controlled by management, management may soon find itself under the control of the system." Sarker and Lee (2003) empirically proved the involvement of strong and committed leadership from higher-level management as the key factor for successful ERP implementation. Commitment and support here means that management is able to foresee any issues that may impact the ERP process (Motwani et al., 2002) and also anticipate the role of senior management to make strategic plans to tackle the issue. Senior level management should also display an orientation towards technology (Yusuf et al., 2004). In addition, Al-Mashari et al. (2003) mentioned that senior level support and commitment should go beyond the initiation and facilitation stages to the complete implementation of the ERP system.

Senior level management must consider the implementation of an ERP system as their top priority (Shanks et al. 2000) because this system has the potential to change the way of conducting business operations. Glaser (1999) mentioned that top management should be committed and such commitment should be reflected in strong leadership, by setting initial limits to the scope of project and striving to achieve early success. Senior level management commitment is crucial for the successful implementation of ERP and in the absence of such commitment, the project either fails or will not be able to deliver complete benefits (Gargeya & Brady, 2005; Beheshti, 2006). In addition, Bingiet al. (1999) mentioned that organisational commitment from the entire organisation could be achieved if senior level management conveys their commitment to all levels of the organisation. As a result, organisational commitment will be well defined and deliver the goals as envisioned, which in turn will ensure the successful implementation of the ERP system (Umble & Umble, 2002).

- **Budget**

It is a universal truth that budget is one of the most important elements for the implementation of any IT project (Upadhyay et al., 2011). The cost of an ERP system depends upon the number of functions and the extent to whichthose fuctions will be implemented. In the case of SMEs, the cost of an ERP system can start at around $15,000 annually for the license of a system for only 15 end users (Rogers, 2002). On the other hand, Koch (2002) has stated that the ownership cost for an ERP system can be around $15 million for large organizations and even up to $300 million for multinational organizations. In the case of ERP system implementation, the cost is not limited to just ownership of software (Upadhyay et al., 2011) but upgrades of the software can be around 30% of the original software cost (Koch, 2002).

- **Time**

Time plays a critical role in the success of an IT project. The amount of time required for the appropriate and proper execution of an ERP system may vary according to the requirements of the end users (Dowlatshahi, 2005). It has been witnessed in the market that some ERP vendors promise to complete the implementation in 3 to 6 months but this only involves the implementation of infrastructure and alignment of software applications and in some cases ERP implementation can take up to two years (Dowlatshahi, 2005). This time is utilized for the training of employees and conversion of data from the old system to the new ERP system to give quick accessibility of data by all the users (Koch, 2002).

3.2.5 Project Support System Factors

Support and advice from external consultants and expert advisors are frequently sought out by private and public sector organisations for the planning, design, implementation and installation of ERP systems. Such consultation and expert advice is helpful to authenticate the implementation of ERP systems in an organisation (Garcia-Sanchez and Perez-Bernal, 2007). Furthermore, consultation with external advisors can bring expertise and experience in the relevant field which may be lacking within the organisation. In the words of Somers and Nelson (2004), consultants and external advisors can give expert advice during different stages of the implementation process and their suggestions can be helpful in solving a problem. However, with the passage of time the role of expensive external advisors or consultants needs to be limited as

the project team members have to take responsibility for the system for themselves (Somers and Nelson, 2004). The majority of the researchers are of the view that ERP implementation is complex, therefore, organisations must seek the help from the experts and consultants who have previous experience in the implementation of the software. The external experts and the consultants can participate in the ERP implementation process at different stages (Xiang, 2007). Similarly, Upadhyay (2011), added that the utilization of the external experts depends upon the coordination of internal operations within the organisation from the beginning of the ERP implementation project (Upadhyay, 2011). According to the McLachlin (1999), an external expert must possess the appropriate skills and knowledge so that a high level of interaction and coordination can be achieved within an organisation (McLachlin, 1999). Similarly, Wang and Chen (2006), highlighted that the expert suggestions by the external advisors can impact the efficiency and efficacy of ERP system implementation. The successful relocation of the knowledge and experience to the organisation adopting the ERP system depends upon the expertise of external consultant (Maditinos et al., 2012).

- **Top Management Commitment and support**

The most discussed and cited KSF in the implementation of ERP systems is the support and commitment provided by the top management of the organization. Davenport (1998: 130) has mentioned that “if the development of an enterprise system is not carefully controlled by management, the management may soon find itself under the control of the system”. Sarker and Lee (2003) also provided proof of their argument that a strong and committed top leadership is the most essential success factor in ERP implementation. Commitment and support by top management can be shown by the anticipation of any glitches that might be faced by the users in the adoption of a system (Motwani et al., 2002). Furthermore, top management is required to make the strategic plans which can be technically applicable in such scenarios (Yusuf et al., 2004). Similarly, the support and commitment by top management should not be limited to the facilitation of the initiation stage but it should be extended throughout the implementation of an ERP system in an organization (AL-Mashar et al., 2003).

Top management must give a high priority to the implementation of an ERP system it is supposed to revolutionize the business operations of the organization (Shanks et al., 2000). The

commitment and support of the top management should be depicted by demonstrating strong leadership, efficient project management and making efforts to achieve early success. If the top management of an organization fails to support the project, in most cases, projects fail drastically or the predicted benefits cannot be achieved (Gargeya and Braady, 2005; Beheshti, 2006). Furthermore, Bingi et al. (1999) stressed that success can only be achieved if the top management has successfully conveyed their commitment and support across all organizational levels. Such commitment can be visibly identified in an organization and can play an important part in the successful implementation of ERP (Umble and Umble, 2002).

3.3 Various performance measurement systems

Lately, many new techniques to measure the performance of information systems have been introduced. The Balanced Score Card BSC was implemented by Hagood and Friedman (2002) and this technique takes into consideration five elements for the evaluation of the performance of human resource information systems. These five components are strategic planning, financial performance, customer perspective, internal process and innovation.

The "Data Envelopment Analysis model" was used by Stensrud and Myrtveit (2003) to measure the productivity of highly successful ERP projects. Statistical methods that measures two performance indicators of ERP implementation were proposed by Lin et al. (2006).

Earlier literature gave multiple performance indicator systems to evaluate the performance of IS. One of the most common systems used common parameters but did not develop customized measurement systems that were suitable for implementing ERP systems.

The Integrated Performance Measurement Systems (IPMS) model", which took into consideration structure was presented by Bititci and Turner (2000). Bititci and Turner (2000) proposed a model as a reference and audit technique for IPMS. Additionally they also discussed some more performance measurement frameworks and models as shown in table 3.6.

Table 3. 5 Performance Measurement Frameworks and Models

Name of Model	Reference
BSC (Balanced Score Card)	(Kaplan and Norton, 1996)
SMART- strategic measurement for world-class manufacturers	(Maskel, 1989)
Performance measurement questionnaire	(Dixon et al., 1990)
Performance criteria systems	(Globerson, 1996)
Cambridge performance measurement design process	(Neely et al., 1995)
IPMS reference model	(Bititci and Carrie, 1998; Bititci, Carrie, and McDevitt 1998a).

3.3 ERP implementation success measures

Based on Delone and McLean's (1992) IS success model and ERP literature, user satisfaction, individual impact, organizational impact, and intended business performance improvement are selected as ERP systems implementation success measures at both individual and organizational levels. Since the objectives of this study are to explore factors that affect the ERP implementation success in Jordanian higher education and variables that could be used to measure and evaluate whether an ERP implementation success is a success or a failure, the interactions among these success measures are not studied.

3.3.1. User satisfaction

User satisfaction was defined by DeLone and Mclean (1992) as the response of a recipient to the product of an information system. In the current study user satisfaction is considered to be the response of the recipient towards the implementation of ERP systems in HEI. User satisfaction was adopted by several researchers as an appropriate measure of success for ERP system implementation (Doll and Torkzadeh, 1988; Delone and McLean, 1992).

3.3.2. Individual impact

DeLone and Mclean (1992), defined individual impact as the effect of information on the behavior of the recipient. In the current study, individual impact was adapted to be the effects and use of ERP implementation on the behaviors of ERP users. The dimensions used for measuring the individual impact are individual productivity, task performance, quality of decisions, effectiveness of decisions, and time taken for decisions.

3.3.3. Organizational impact

DeLone and Mclean (1992) in their IS success model, defined organisational impact as the effect of information on the performance of an organisation. This study has adapted organisational impact to be the effect of ERP implementation and its use on the performance of HEIs. The dimensions included in the measurement of organisational impact are the operational cost of organisation, enhanced productivity, customer service, and realization of ERP implementation objectives.

3.3.4. Intended business performance improvement

According to White et al. (1982), the intended business performance improvement can be taken as a measure of the success of an ERP implementation. In an ERP implementation project, the researchers included: cost reduction, time saving, and business process integrations as a masure of performance objectives. In this study they concluded that although organisations have different objectives on the whole, when all these measures are giving positive signs then it can be said that the ERP system implementation was a success

3.4 ERP Implementation Lifecycle Phases and Stages

The implementation of ERP systems happen in collaboration with various functional departments and therefore the process becomes multidimensional in nature. Here the dimensions are: time, availability of resources, authorities and hierarchies, advantages, working methods, systems and the overall organizational culture. An ERP system is implemented in the form of a project or a technical system that has an influence on every function of the organization. However, there are certain sequential steps that remain the same in the lifecycle of ERP implementation certain modifications or changes are necessary according to the nature of the organization and its decision-making processes. According to Frambach and Schillewaert (2002), the lifecycle of ERP implementation was comprised of the pre-implementation phase, implementation phase, and post-implementation phase. However, the researchers noted that there were several iterations involved in the lifecycle of ERP systems where revisions, re-implementation, and upgrades were made at every stage of the process.

The implementation of an ERP system needs to be completed through three major life-cycle phases that are multi-faceted and complex in nature. This calls for a detailed and appropriate knowledge of the ERP product before actual implementation in an educational institution. This can be achieved by using fully qualified experts to advise organizations in a holistic manner on the implementation of every module in the ERP implementation. However, it is necessary to analyse and identify any such issues and requirements at the pre-implementation stage so as to avoid any difficulties in the later stages of ERP system implementation.

There are several frameworks and models available in the literature associated with the lifecycle of ERP implementation (Esteves and Pastor, 1999; Parr and Shanks, 2000; Markus and Tanis, 2000; Rajagopal, 2002; Al-Mashari et al., 2006; Peslak et al., 2008; Chang et al., 2008; and Law et al., 2010). However, the use of phases or stages is found to be the most common in the implementation of ERP systems. Generally, the lifecycle is explained as a five-step process where project preparation takes place in the first phase, a business blueprint is designed in the second stage, realization is undertaken in stage three followed by the final preparation under stage four and go live and support in the final phase. These detailed phases are categorised under three major stages as shown in the Figure 3.5:

- Pre-Implementation Phase (Initiation and Adoption Stage)
- Implementation Phase (Implementation and Shakedown Stage)
- Post-Implementation Phase (Evaluation and Optimization Stage)

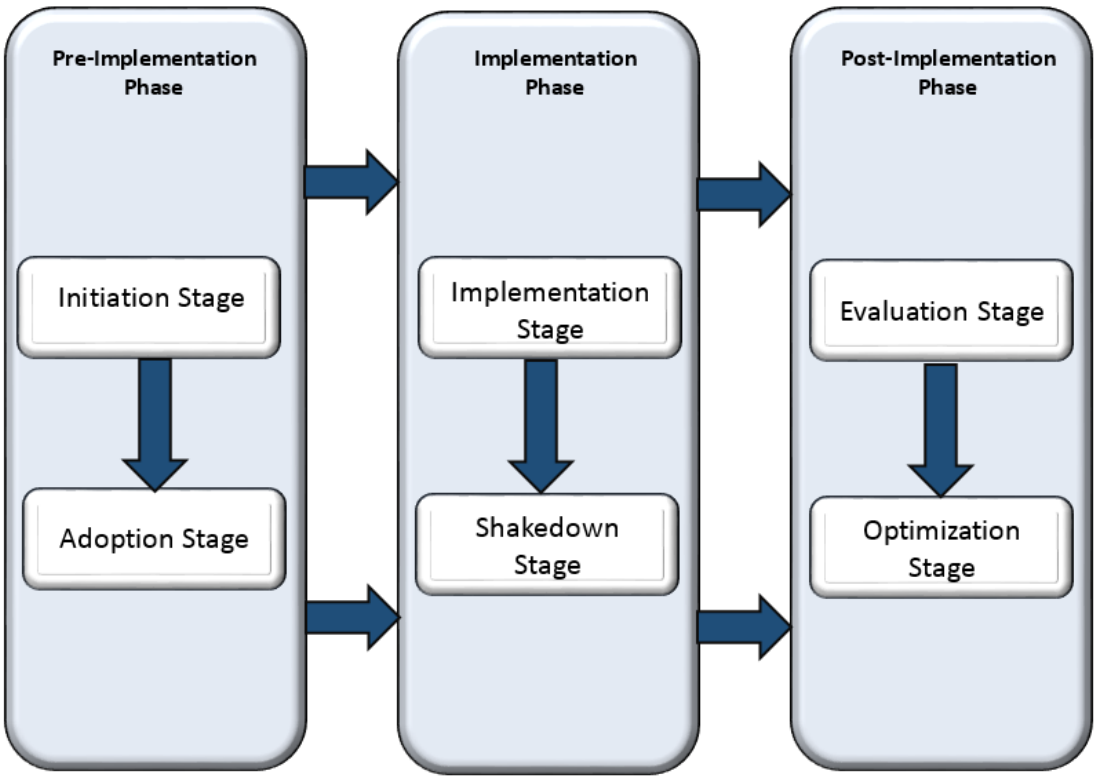

Figure 3. 5 ERP Implementation Lifecycle

Source: The Researcher

3.4.1 Pre-Implementation Phase

Initiation Stage: This is the initial stage of ERP implementation where the activities associated decision for implementation and feasibility study are analysed. In this stage, the focus is on studying and understanding the organizational requirements and availability of resources to make the whole process of implementation feasible and practical. Furthermore, this stage is comprised of rigorous analysis of the available choices leading to the design and specifics for the successful evaluation of the process of implementation. As discussed by O'Brien and Marakas (2007), there are several tools that can be used for measuring the success of ERP implementation and should be used to make the final decision for the introduction into the organization. This is the phase of the ERP lifecycle where the actual reason for implementation, challenges and risks associated with the process, and team of potential vendors and consultants as well as benefits and demerits of the new system are studied and analysed. As this is the initial stage of implementation, any mistakes at this level can result in major conflicts and chaos in later stages of the implementation. Therefore, this particular stage should be considered the most demanding in terms of studying all the factors associated with the actual implementation and its results on the organization.

Adoption Stage: This is a sub-phase of the pre-implementation level where the actual acquisition of ERP is considered and undertaken by the managers. This phase is focused on planning and designing ERP on the basis of a need analysis conducted in the last phase of implementation. As Esteves and Pastor (1999) explained, various key features associated with cost, human resources required, training and monitoring, and maintenance issues are identified under this phase. According to Markus and Tanis (2000), certain specific activities where the configuration of software is completed, together with the integration and testing of the system are crucial to this phase of ERP implementation. This particular phase is also characterised with an actual roll out and training decisions where the way of conducting implementation is decided and communicated. Al-Mashari et al. (2006) considered planning, designing, choice of the type of implementation (e.g. big bang or phased), testing and training of staff members as the key activities to be undertaken and completed during this phase of the ERP implementation lifecycle.

3.4.2 Implementation Phase

Implementation Stage: In this stage the actual ERP is rolled out and implemented once the preparation of the design and maintenance is completed. The main activity of this stage is the installation and initiation of the ERP system. Practical issues associated with running ERP systems are identified in this stage. The foundation of this stage involves the rolling out and implementation of ERP by the users in an organisation for their daily activities. As well as conducting the sale, responsibility for disseminating working knowledge and training for critical issues in the process of implementation should be taken by the vendor (Esteves and Pastor, 1999). The decision to implement ERP in one specific department and check its progress, or implement ERP across all branches worldwide is taken by the organisation. Therefore, the decision to select the phased or big bang approach is an extremely key factor at this stage. This phase, when the system goes live is considered to be the most disruptive and time consuming period (Ross & Vitale, 2000).

From the Project Phased Model (PPM) perspective, Parr and Shanks (2000) divided the implementation stage of the ERP system into: installation, configuration and testing, design, re-engineering, and system set up. Key factors during this stage included: support from management, an expert team of the required number, readiness to change, and management of the deliverables as per the goals and scope defined prior to implementation.

Once an organisation adopts a new system, there is a high possibility that this may lead to a rise in the demand for usage, higher training needs, modifications to the processes, higher integration of various units, and enhancement of the features for utility and compatibility. These aspects may further impact the acceptance of the system across the organisation and may lead to a shake-down stage (Rajagopal, 2002), which is discussed in the next section. All the details of the ERP system roll out need to be monitored and adjusted for the successful implementation of this stage (Al-Mashari et al., 2006).. Although an ERP implementation will allow higher level management to control the complete business process of an organisation (Sethi et al., 2008), to be successful, it requires support from higher level management (Somers and Nelson, 2001), a competent and technically proficient project team (Mendel, 1999), efficient communication between the internal team and external vendors, and an in-depth knowledge of the

organisational culture (Plant & Willcocks, 2007). Law et al. (2010) categorizes the maintenance and the provision of services for ERP into contagion, control, and integration by Law et al. (2010). They observed that involving stakeholders in the production of a detailed preparation and training plan can prevent conflict or unnecessary customisation which can impact the success of the implementation. It will also facilitate an easier transition from one stage to the other (Peslak et al., 2008 which causes less disruption and reduces the chances of a shake-down stage, which is explained below.

Shakedown Stage: This stage is one of the phases of the implementation phase of ERP. It is comprised of activities like maintenance, monitoring, and modification and is extremely important for the successful implementation of ERP. This phase is continued even after roll out until normal operation is achieved and the implemented system become part of routine usage. Operations managers, remaining project team members, IT and technical support staff, and end users are the key stakeholders at this stage (Markus & Tanis, 2000). Further stabilisation and routinisation of ERP usage is dependent on the activities performed during this stage (Rajagopal, 2002). How long this stage lasts depends on factors like the speed taken to fix issues, resolution of conflict within team, adjustment of the system to perform, and training of the staff involved in the usage of the system (Markus & Tanis, 2000).

According to Al-Mashari et al. (2006), the IT skills of the team and vendor support are two technical risks associated with this stage. These risks can be mitigated by the establishment of clear goals, involvement of higher level management, leadership, and training. The review of the literature, has shown that the shakedown phase should be short to make the transition from disruptive to normal operation easier and to increase the benefits derived from implementation. The evaluation of the usefulness of the ERP system and the tangible advantages achieved by the implementation can be evaluated during the post-implementation phase, which is discussed in the following section.

3.4.3 Post-Implementation Phase

Evaluation Stage: Here the focus is on the evaluation of the results and issues derived as a result of the ERP implementation. The emphasis of all activities and functions is on reporting the results, during which managers monitor the post-implementation usage and evaluate the benefits

achieved. As Esteves and Pastor (1999) explained, top management discovers the tangible benefits and possible challenges to be faced in bringing about a new method of work and the ways to tackle such challenges while ensuring commitment and collaboration from the staff members. A proper and detailed evaluation is necessary to ensure a direct link between the core values and overall advantages derived by the organization. This is followed by further improvements to the implemented system which are described in the following section

Optimization stage: The activities performed in this particular phase of optimization comprise the organizational transformation based on a successful ERP implementation (Markus and Tanis, 2000). It is possible to reach this particular stage after implementing ERP in a conflict free manner where technical bugs and repairs are undertaken on a regular basis to avoid any significant issues (Parr & Shanks, 2000). During this stage, there is an integration of the benefits of the ERP system and the planned goals and objectives of the organization.

3.5 Theoretical Frameworks

3.5.1 Concept of Theoretical Framework

Frameworks are the tools that assist a researcher in organizing and integrating the different aspects associated with the issue studied in a simple and dependable way to attain the desired results (Montagna, 2005). Frameworks are vital for the researcher as they help to organize and integrate the varied aspects related to the problem in a simplistic way with consistency and ensure that pursued outcomes are achieved (Montagna, 2005). There are various arguments regarding the relevance versus the utilization of frameworks. From the viewpoint of Oats (2006), theoretical frameworks should be used to highlight the main problems concerned with the topic under investigation. There is a need for the development of a theoretical framework to assess the main factors affecting the implementation of an ERP system in a university environment. However, before starting this, it is very important to study the existing frameworks designed by various academics. The next section will present and discuss these frameworks.

3.5.2 DeLone and McLean's IS success model (D&M)

DeLone and McLean's (1992) IS success model (see figure 3.6) has greatly contributed to the literature for the measurement of success in information systems. According to Ballantine et al. (1996), in spite of the fact that DeLone and McLean (1992) reviewed one hundred and eighty studies from academic journals this model was also influenced by the work of Shannon and Weaver (1949) and Mason (1978). These studies covered the period between 1981 and 1987 and were regarded as the first studies that attempted to give some order and parameters for the development of a comprehensive model for information systems (Gable, Sedera, & Chan, 2008). Systems quality, information quality, use, user satisfaction, individual impact, and organisational impact were identified as the main categories of information system success. Figure 3.6 presents and demonstrates the relationship between these categories. It was suggested by some researchers that "temporal and causal" types of dependencies existed between these relationships (Seddon & Kiew, 1994; Ballantine et al., 1996; Myers, Kappelman, & Prybutok, 1997; Seddon, 1997).

Figure 3. 6 D&M IS success model

Source: DeLone and McLean, (1992)

Sabherwal, Jeyaraj, and Chowa (2006) argued that the DeLone and McLean (1992) IS success model was not empirically tested. However, many studied and then attempted to test, modify, and develop this model to check its validity. Seddon and Kiew (1994) were the first researchers that tested this model empirically and also tested the process and casual explanation implied by this model. After testing, they extended the "D&M model", and proposed another alternative to this model of success. Further work on the "D&M model" was performed by Rai et al. (2002) and Sabherwal, Jeyaraj, and Chowa (2006).

Seddon (1997) mentioned that DeLone and McLean confused the process because they combined the process and the causal explanations of IS success. His study was important as Seddon adopted a theoretical approach to modify the "D&M model". Seddon differentiated between the actual and expected impact, and there was an additional specification of perceived usefulness in his model (Sabherwal, Jeyaraj, & Chowa, 2006). Seddon argued that successful systems provided benefits like doing more work of better quality in the same time, or doing work of the same quality in less time, than in the past (Seddon, 1997). The researcher emphasizes the individual impact, which according to DeLone and McLean (1992 p: 137) is “the effect of information on the behaviour of the recipient for all measures of IS success.” Gable, Sedera, and Chan (2008) defined the individual impact as the “measure of the extent to which the IS has influenced the capabilities and effectiveness, on behalf of the organization, of key users.” The reason behind considering individual impact is its practical aspect as the impact is closely associated with performance.

DeLone and McLean (1992) are of the opinion that impact can be considered as the signal that the information system has provided the user with a better understanding of decisions when related to their context. Impact indicates decision-making and productivity of the user has been improved. Usefulness is the extent to which an individual believes the use of the specific system can enhance work performance (Seddon, 1997).

DeLone and McLean's model was further expanded by Pitt, Watson, and Kavan (1995) to include a service quality component as a measure of IS success. They argued that the D&M model needs to account for the IS department's service role, so the model needs further expansion. Additionally, DeLone and McLean, in their theory have made categories for communication. Therefore, the IS department provides not only products but also services. Many researchers are of the opinion that service quality is a crucial factor and needs to be added to D&M's IS success model as it is a most crucial feature of IS success (Petter, Delone, & McLean, 2008). Apart from this, there is a risk of incorrect measurement of IS effectiveness if the assessment of service quality was not considered. Petter, Delone, and McLean (2008 p: 68) defined service quality as "the quality of the support that system users receive from the IS department and IT support personnel." In addition to this, the service quality of the IT department as opposed to individual IT applications, should be considered, by measuring and comparing user expectation and their perceptions of the IT department (Petter, Delone, & McLean, 2008).

The above argument has been further supported by many researchers, such as Conrath and Mignen (1990) who mentioned that the quality of service is the most important consideration for user satisfaction, and the second most important consideration was matching user expectations with the actual IS service provided. Satisfied user expectation has a strong influence on the overall satisfaction (Rushinek & Rushinek, 1986). The service quality can be assessed by the measurement of customer expectations and perceptions of performance for different types of service parameters (Pitt, Watson, & Kavan, 1995).

Ten years later, DeLone and McLean (2003) considered this argument and incorporated the service quality factor in the IS success model. In 2008, Petter, Delone, and McLean, also mentioned the use of the updated "D&M IS model." They evaluated the uses of this model over a period of drastic IS change like the speedy growth of the e-commerce platform. The updated

DeLone and McClean model containing the added service quality parameter is shown in Figure 3.7.

Some materials have been removed due to 3rd party copyright. The unabridged version can be viewed in Lancester Library - Coventry University.

Figure 3. 7 Updated D&M IS Success Model

Source: DeLone and McLean, (2003)

Current research lays stress on "service quality", which is a crucial aspect of IS success measurement. The research suggested that "stakeholders' expectations of service quality and their performance level are correlated." Therefore, the service quality parameter for the measurement of stakeholder performance in ERP systems is very important. Sedera and Gable (2004) worked further on their earlier work in 2003 and derived a standardized tool, shown in Figure 3.8, which validated the measures of success for enterprise systems. This tool was based on the research cycle developed by Mackenzie and House (1979) and McGrath (1979). Chien and Tsaur (2007) also used the "updated D&M model" for their research in organisations that implemented ERP.

Figure 3. 8 Validated Measures of ERP,

Source: Sedera and Gable, (2004)

Weli (2014) argued that Sedera and Gable's (2004) modified model, especially the tool used for the evaluation of IS success, was unique as it takes into consideration the multidimensional and complicated nature of IS success.

Bernroider (2008) investigated the role of IT governance and its impact on the success of ERP implementation as it was difficult to assess the economic and organizational benefits in "DeLone and McLean's updated model." The study took into consideration the success of ERP implementation at the usage stage, after ERP is implemented. "DeLone and McLean's updated IS success model" also considered social actors as did Bernroider (2003). Ballantine et al. (1996) further added to the "DeLone and McLean model" and proposed a new 3D version that improved the model by dividing IS success into technical development, deployment of the user, and the delivery of value to the business.

3.5.3 Critical Success and Risk Factor Theory

The critical success and risk factor theory (CSRF) has been used for ERP project management (Sullivan, 2009). CSRF theory focused on finding the remedies for failures or delays by comparing and analyzing previous projects and making comparisons between the organisations and industries, levels of management, project teams and IT teams (ERP IT Toolbox, 2007; Hawari and Heeks, 2010). Ifinedo and Nahar (2007) identified information quality, system quality, individual

impact, organisational impact, vendor or consultant quality, and workgroup impact, in their model for ERP project success. The majority of the KSFs for ERP implementation are perceived from a risk factor perspective. A model of risk factors in ERP implementation could also include environment, organisational context, information system and project specific elements (Scott and Vessey, 2002). The success and risk factors in an ERP implementation have been analysed on the basis of implementation related ERP specific factors (Gattiker, 2002) along with the long term and short term factors (Ghosh and Skibniewski, 2010). Success and risk factors include, management and leadership, environment, complexity of project, project team, communication, selection of software, training, time, personal capacities and capabilities, finances, IT infrastructure, and expectations (Dowlatshahi, 2005; Gattiker, 2002; Ghosh and Skibniewski, 2010; Graham, 2009; Omerzel, Biloslavo, and Trnavčevič, 2011; Pratt, 2009; Sprenger, et al., 2010a; Tsang-Kosma, 2010). Li Liao (2006) considers how external help can improve the chances of a successful implementation. The organisations who implement the new IT system can have knowledge about the experiences of others, products offered by the vendors, services of consultants, and can compare these available resources along with the requirements of the organization. The results from this comparison can be used to help the organisation achieve its objectives. Similarly, the vendors, consultants, and employees who have the knowledge about the requirements of an organisation and its processes can provide customized solutions in the shortest time to make the implementation successful. CSRF theory is a helpful model which can introduce match and compare the already available knowledge of implemented projects with the requirements of the organisation. Therefore, the experiences of other projects of similar nature can be utilized to have the best implementation strategies and opportunities in the specified organisation (de Millo, 2005). The implementation of new IT systems depends upon the hierarchical structure; leadership styles; management; and prevailing culture, of the organisation. Although, an understanding of the organisation and the knowledge of the system cannot be considered as a guarantee for ERP success, these factors must be considered as the KSFs in ERP projects (Chen, 2009; Li, et al., 2006). In order to apply the CSRF theory to a specific project and develop specialized solutions, the definition of project success must be agreed by all the stakeholders (Aldayel, et al., 2011; Frantz, Southerland, and Johnson, 2002). Success of a

project can be attributed to the measurement of the outcomes including the return on any investment. However, this definition differs from project to project or organisation to organisation (Frantz, et al., 2002; Sedera, Gable, and Chan, 2004). CSRF analysis focused more on the managerial and IT level in the majority of the projects (Dues, 2010; Graham, 2009; Lapham, 2009; Pollock, 2003; Pratt, 2007). However, it is considered that as subject of CSRF analysis, the the technical team only has a limited influence on project success (Khatib, 2010; Sullivan, 2009), however the importance of end users on system success has been emphasized (Dredden and Bergdolt, 2007). Therefore, the stakeholders and their influence must also be considered as an important KSF for the success or failure of an ERP implementation project.

3.5.4 Process Model

The process of ERP implementation exerts pressures on the development of the initial business plan, configuration of the software, and improvements to the business processes. Hence, the implementation of an ERP system must be considered as a business project rather than a technological initiative (Markus et al., 2000). Shanks (2000), developed a phased ERP implementation model on the basis of fifteen case studies. The phases were: design, implementation, stabilization, continuous improvement, and transformation. The design phase was focused on the selection of the ERP system, identifying the scope of the project and the development for the architecture of the system. Configuration and implementation of the software was part of the implementation phase which was a complex process and if not properly managed could reduce the performance of the organisation. The stabilization phase resolves the problems and issues from the initial implementation and organisational performance is enhanced (Shanks, 2000). Ross (2007), argues that the majority of organisations stay in the phase of stabilization for long periods which can extend to years. In the continuous improvement phase the system is continuously maintained, improved and upgraded which finally goes to the transformation phase (Shanks, 2000). Ross (2007) maintained that only a small number of organisations reach the transformation phase and large ERP system implementations sometimes involve a variety of cycles through the model for every module in the ERP system (Ross, 2007). The ERP implementation process model was revised by Markus and Tanis (2000). The phases of their model included; chartering, project, shakedown, and onwards or upwards. The chartering

phase included the development of business plan, selection of ERP system, appointment of project manager, and approval of budget and schedule. The project and shakedown phases were similar to the implementation and stabilization of the Ross model. Similarly, the onward and upward phases were similar to the continuous business improvement and transformation phases of the Ross model.

The two process models provided the basis for the phased process model proposed in this research which is presented below in figure 3.9. When detailed out, the planning phase of the process model has the broader business focus from the Markus and Tanis chartering phase and the technical project aspect from the Ross design phase. The phases of implementation and stabilization are taken from the Ross model. The fourth phase is termed as the improvement which has the feature of incremental as well as radical improvements to the business process. The current study enabled the detailed examination of the ERP implementation lifecycle map and helped the researcher to identify the key success factors across all the the phases of the ERP implementation lifecycle.

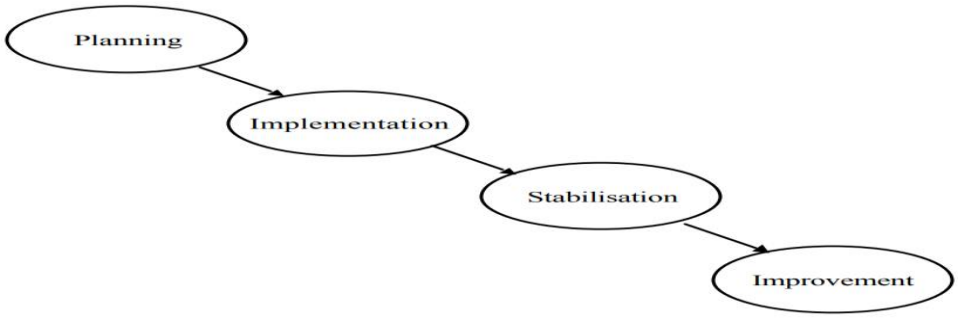

Figure 3. 9 Process Model

3.5.5 Critique of literature

Several key success factors which influence the decision-making process in the ERP implementations have been identified in the current study. They are a) the significance of the ERP implementation in HEIs as well as in other organisations, and b) the identification of influential factors which can affect the success of ERP implementation. Although all the factors provide an insight on ERP system implementation there are a limited number of studies which focused on the importance and influential nature of key success factors on the decision-making process for ERP implementation (Ahmad et al., 2007; Ozyilmaz and Berg, 2009; Uwizeyemungu and Raymond, 2011). However, these factors are much more useful if their importance within the implementation process is also considered. In this research the identified factors have been given a priority level of 'most important' to 'least important'.

Somers and Nelson, 2014, discussed the use of factors in the stages of the implementation life cycle. The stages in the model, originally proposed in the combined work of Rockert (1979) and Somers and Nelson (2014), were initiation, adoption, acceptance, routinisation, and infusion. The researcher has mapped the proposed key success factors along with the stages in which they are applied within the lifecycle which make the study the only one of its kind to focus on both the factors as well as the stages of the life cycle of ERP. There are number of models which have identified the ERP lifecycle, stages and phases, starting from the idea of adoption to the actual realization of the benefits in an organisation (Al-Mashari, 2006). The review of the literature indicated that there was a limited discussion of theoretical and empirical research on the prioritization of the importance of KSFs and mapping of these factors on the ERP implementation lifecycle stages especially in the context of HEIs. Integrated infrastructure was considered as one of the challenges for HEIs (Ahmad et al., 2007). Researchers and practitioners are placing more importance on the need for more research on the success factors for ERP implementation in HEIs. From the research based on key success factors on ERP implementation in the higher educational institutes of Jordan, ERP systems in higher educational institutes is an additional tool to enhance the efficiency of decision-making process (Dorobat and Nastase 2010). It also considers the higher educational institutes as a business entity and tries to extract the benefits which these

systems will generate in betterment of their business operations. Research also highlights the impact and usage of ERP software and how they help an educational institute to make better decisions. For the analysis of the factors responsible for failure of ERP implementation in HEI the researcher has evaluated another important research which has a much broader view towards identification of the key success factors of ERP systems in higher education sector. It basically gives major emphasis on the higher failure rate of ERP implementation in the projects and by highlighting the factors which are responsible for the failures, give emphasis on the how it can be improvised. There are some drawbacks which the major focus research on the western universities, however failure in one region cannot be reason of failure in other reason as well (Scholtz and Kapeso 2014).

Almshari (2002) asserts that having ERP systems frequently topping the list of themes in major academic IS studies reflects the dire need for research in this rapidly field. Indeed, as ERP systems continue to spread more widely, the need for new research to address various issues in this context has become even more urgent. In addition, Howcroft and Wagner (2004) emphasise that it is essential to focus research on the design, implementation, use and evaluation of ERP systems within and across contexts. Thus, researchers should examine the ways that such systems are shaped by individuals and groups as well as by organizational and social structures and cultures. Therefore, there is no doubt that concentrating on these aspects will affect the development and use of ERP, which will shape the behaviour and attitudes of the stakeholders.

On other hand, Khalifa et al. (2001) argue that there is sufficient evidence in the IT literature to suggest that IT system users are excluded from the evaluation process, especially when traditional methods focus on technical factors and direct costs rather than on human aspects. Therefore, researchers like Pouloudi and Serafeimidis (1999) argue for matching the IT evaluation approach with the culture of the organisation to achieve successful development of systems in line with the needs of stakeholders as individuals, groups, organisations and societies.

A review of the literature also suggests that most existing ERP research focuses on selection and implementation, not on post-implementation impact, although several studies suggest that ERP systems go through a post-implementation breaking-in phase, in which the organisation may not experience the hoped-for performance. However, the ultimate impact of ERP systems on

organisations once implemented and 'shaken down' has not been as thoroughly researched (Gattiker and Goodhue, 2005; Somers, Nelson, and Ragowsky 2000).

Even though ERP has been developed, evolved and implemented around the world for almost two decades, Helo, Anussornnitisarn and Phusavat (2008) note that there are still many recently published reports of difficulties in its implementation. Many have reported that ERP implementations failed to achieve the organisation's targets and expectation, because a project is not complete without post-implementation evaluation (Finney and Corbett, 2007).

As a response to this need, in this research the ERP lifecycle within HEIs has been categorised into pre-implementation, implementation and post-implementation phases and the key success factors have been prioritized according to their importance while mapping the factors to these phases.

3.5.6 Conceptual Framework for this Research

The literature available on ERP along with the research model of IS as proposed by DeLone and McLean helps to definine the variables for measuring the success of an ERP implementation. Furthermore, the key success factor theory helps in explaining the reasons behind failures, delays, and resource overrun. The process model enables the researcher to identify which key success factors are important in the process model phases. The process model and key success factors will provide a useful guide for organisations planning to implement ERP systems. For this study it is better to consider the IS success model as provided by DeLone and McLean, as it helps to measure the success of implementation from various perspectives. Additionally, ERP systems are also a type of IS, Therefore, the research framework should allow for the combination and adaptation of the process model for success in ERP with the suggestions from the literature associated with success in ISs as shown in Figure 3.10. The results of the literature review emphasized the need for a model that was more effective and applicable for successful implementation of ERP by educational institutions in future. This conceptual framework presents the influential factors and prioritizes them according to their importance, while mapping these factors across the ERP implementation life cycle phases and stages.

When these measures of success interact with each other, they may give different results, but this is beyond the focus of the present study. Consequently, and in order to make it applicable to

ERP systems, there is less importance placed on previous measures for system and information quality. This is because although the information output from the system may or may not satisfy the user they have to accept what the IS produces. As a guideline for the present study, the researcher has focused on the following research objectives:

1) Identification of the factors which influence the ERP implementation,

2) Prioritization of the factors according to their importance for the successful implementation of ERP,

3) Examination and mapping of the influential factors for different lifecycle phases and stages to achieve a successful ERP implementation.

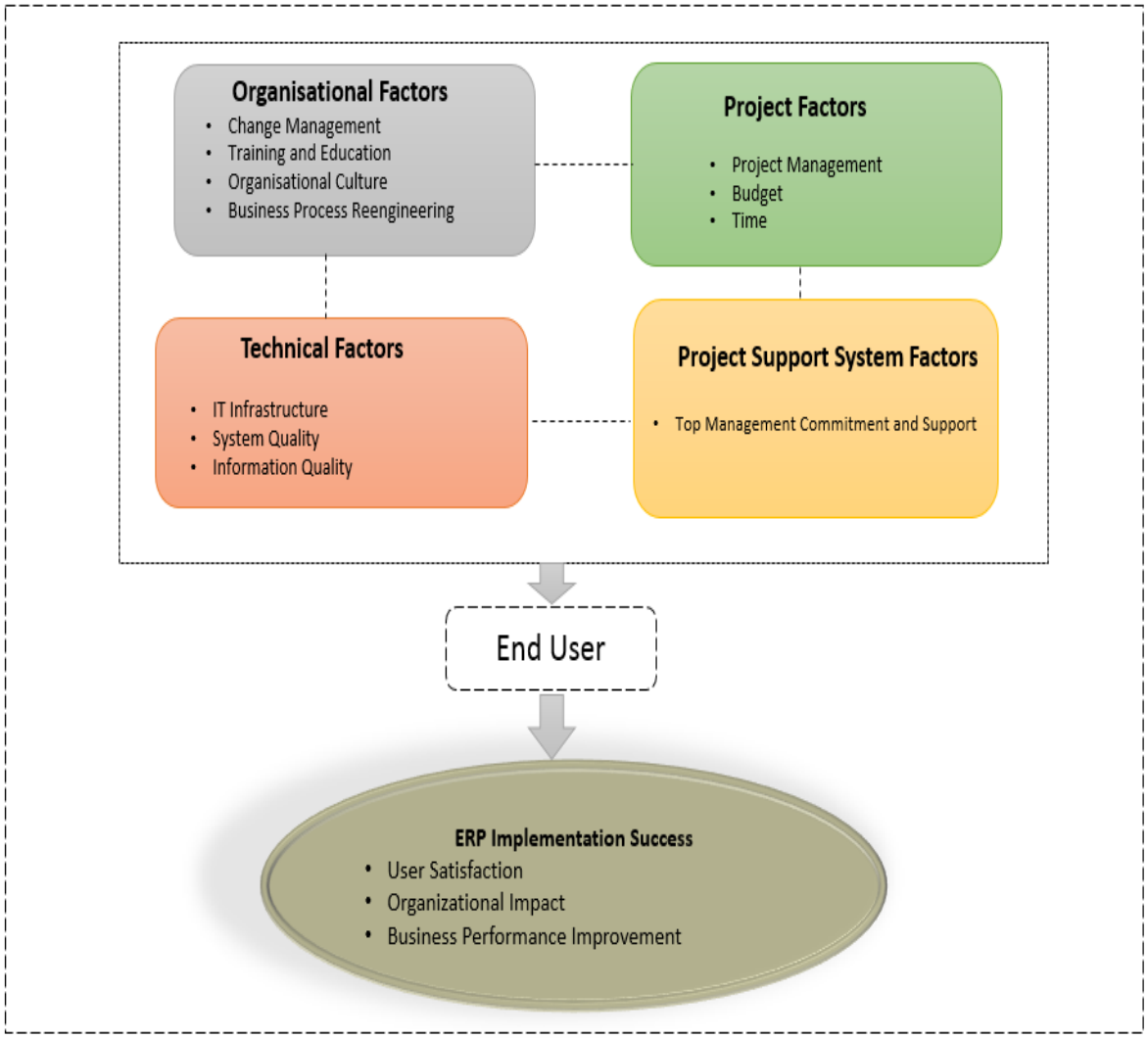

Figure 3. 10 Conceptual frameworks for studies of effects of key success factors on ERP implementation success

**Note: End Uses are the stakeholders who is using the ERP system on their daily basis*
**Source: The Researcher*

3.6 Chapter Summary

In this chapter the researcher assessed the ERP implementation literature and identified the gaps in the research when the findings were applied to the higher educational context. Based on the review of the literature, there are various key factors that assisted in the successful implementation of ERP. Eleven factors that were critical to the success of ERP implementation in HEIs were identified. From the literature review, four broad dimensions of KSFs were identified, which were organisational, technical, project and system support which accounted for all eleven KSFs. The researcher presented different ERP implementation lifecycle phases and stages. The implementation lifecycle phases and stages were identified by analysing different IT/IS adoption models. By synthesising the most commonly used models, namely, Delone and Meclane IS Success model, Critical success factor theory, and the process model, a framework was developed for this research that associated the KSFs identified with ERP implementation in the higher educational sector. The researcher then developed a conceptual research framework to guide the research.

CHAPTER 4 RESEARCH METHODOLOGY

4.0 Chapter Overview

In Chapter Three, the conceptual model for ERP implementation in HEIs for this research was developed following a systematic review of literature. This chapter describes and justifies the research methodology adopted for this research. Information systems (IS) are ubiquitous and can be found in almost every field or discipline. The study of information systems is thus complicated by their many facets in different surroundings, and the selection of the appropriate research methods is complex. IS researchers have had difficulties advancing the discipline with the end result being the development of different approaches (Mathiassen, 2002). There is agreement, however, that no single approach will fit every study and that a variety of research approaches, methods, and techniques should be considered for different situations and address the specific research questions (Yin, 2013).

The main components of the research methodology pertaining to this research will be based on research philosophy, research design, and sample selection along with the sampling criterion. The collection of data will be from case studies based on information system research. The reliability and validity of the research instruments will be covered followed by the ethics considerations to conclude the research methodology. Also, the case study method, its justification, and use of the case method will be discussed.

The choice of the methodology and methods for this research study have both been chosen to achieve the research objectives, and this chapter will present the justifications of the choices and the rationale for use. The research process, design, justification of the chosen methodology, and finally the case studies will be discussed and explained in detail.

4.1 Research Philosophy

4.1.1 Understanding various philosophical stances

Figure 4. 1 Research Philosophies

Source: (Saunders et al., 2016)

The first section of this chapter focuses on the examination of the philosophy of research study, where philosophies are developed in order to explore knowledge development and the nature of such knowledge Figure 4.1 showing the various research philosophies. The development of knowledge under this section may not be as dramatic as a new motivational theory, but if it is focused on resolving a specific issue, it is, nonetheless, developing new knowledge. In the present study, the research philosophy is comprised of some key assumptions in relation to the way to view the world. Here the research strategy is formed on the basis of these assumptions along with the selection of methods as part of the strategy. In part, the practical issues and scenarios influence the research philosophy as considered by the researcher. However, the key influence comes from the relationship between knowledge and the process used to develop it. The concern of the researcher about the issues, such as availability and requirement of resources, is likely to result in a very different view of the way research should be conducted.

4.1.2 The Rationale of the Interpretivist Philosophy

The key assumption associated with interpretive research is the access to reality (given or socially constructed) that can be achieved through social constructions, such as language, consciousness, and shared meaning. As per the view of Boland (1985), interpretive research has its philosophical base in hermeneutics and phenomenology. The general scenario for interpretive studies is the focus on understanding the phenomena through the meanings assigned by different people. Furthermore, the aim of interpretive methods is to present an understanding of the context of

the IS and the process through which an influence is placed by the information system and is influenced by the context (Walsham, 1993, p. 4-5). There is no predefinition available for an interpretive research study in the context of dependent and independent variables, however, it focuses on the complexities associated with human senses in any emerging scenario (Kaplan & Maxwell, 1994). The interpretive approach can be understood through examples of qualitative research studies like that undertaken by Boland (1991) and Walsham (1993).

Every researcher faces the challenge of selecting an appropriate approach for the research work. Under the present study, the researcher is using interpretive research and justifies the selection on the basis of the underlying research assumptions for the investigation of implementing an ERP system in HEIs. The interpretive research is selected for the following reasons:

- The previous two chapters present a critical analysis of the literature and initial theoretical framework which explains the effects on the business process, organization, and technical areas by the implementation of ERP. These factors result in a combined influence that is difficult to understand because of the complexities of the inter-relationship between them. Therefore, a critical understanding of such factors is required through a detailed interpretation of the factors in different organizational contexts. Additionally, the need of prioritising these factors and mapping against each phase of the lifecycle is required to support case studies strengthening the process of decision making for the implementation of ERP. Thus, under the present study, there is a need of an interpretive philosophy to gain clarity on the process for implementing ERP and supporting the prioritization and mapping of the influential factors of ERP.
- The second key reason for the selection of the interpretivist philosophy is to facilitate the understanding of the different conceptions of managers and the viewpoints of users while avoiding any bias. This will in turn call for a detailed description of the subject. Such a research study makes an interpretivist approach the appropriate philosophy to conduct the study. However, while adopting this particular philosophy of research, not much attention is given to the generalization of results because in the case of higher educational institutions there is a possibility of the need to modify the theoretical propositions presented by the existing research (Bryman & Bell, 2007; Saunders et al., 2007). This becomes possible due to the

different needs of higher education institutions and the resources they manage compared to other types of institutions. Such a philosophical approach is also termed a phenomenological paradigm where the investigation to study the occurrence appears to have an effect on the issue or question under study itself. Researchers prefer such a stance especially while carrying out studies for the development of theoretical issues and designing theories that are conceptual and substantive in nature (Bryman & Bell, 2007).

- The third major reason is that it is not possible to condense the social world for the isolation of determinants like space and mass; it becomes necessary to consider it in its entire form. It is clear from the available literature that positivist approaches present results that can be generalised in scenarios where data is collected which subsists in the communal world (Shaw, 1999). Thus, the researcher is of the view that the investigation of an ERP implementation in higher education institutions is in need of a philosophy which allows such institutions to be viewed and understood in their totality, resulting in a need for academics and researchers to collaborate with the respondents, work on actual scenarios, and thus enlighten their perceptions.

Selecting such a philosophy guides the researcher to the preferential choice of an inductive research approach. This approach is explained in further sections and explains that the interpretivist philosophy is the appropriate philosophy for conducting the present study.

4.2 Research Approaches

4.2.1 Understanding various research approaches

Figure 4. 2 Research Approaches

Source: (Saunders et al., 2016)

There are two general approaches to reasoned arguments, inductive reasoning and deductive reasoning, which may be used to build new theories regarding specific phenomena or a set of data. Inductive reasoning builds an argument by starting with the observations of specific instances or set of data and then trying to generalize conclusions about the subject under study. Deductive reasoning builds an argument by starting with an established theory or generalisation and then investigating to see if the theory applies to specific instances or a set of data.

There is also a third approach, abductive reasoning, to develop a valid theory which is commonly used in research. This reasoning begins with a "surprising fact" being observed (Ketokivi & Mantere, 2010). The surprising fact is the conclusion rather than the evidence. Based on this conclusion, a set of possible specific instances or data is inferred that provides the best possible explanation of the conclusion. If it is reasoned that the evidence is true, then the conclusion would be true as a matter of course. Because the set of data is sufficient (or nearly sufficient) to explain the conclusion, this provides a reason to believe that the conclusion is also true.

These three approaches to theory development can be used in research. If the research starts with a theory, often developed from reading the literature, and the design of the research strategy is to test the theory, then the deductive approach is being used. Conversely, if the research starts by collecting data to investigate a phenomenon and builds a theory (often in the form of a conceptual framework), then the inductive approach is being used. However, collecting data to investigate a phenomenon, to generate a new, or modify an existing theory, which is

subsequently tested through additional data collection in a kind of synthesis of inductive and deductive reasoning, then an abductive approach is being used Table 4.1.

The next three sub-sections explore the differences and similarities between these three approaches and their implications for research.

Table 4. 1 Deduction, induction and abduction: from reason to research

Some materials have been removed due to 3rd party copyright. The unabridged version can be viewed in Lancester Library - Coventry University.

Source: (Saunders et al., 2016)

4.2.2 The Rationale of the Inductive Approach

The high rate of failures reported in the implementation of ERP makes it important that an inductive approach is applied in the present study to understand the implications for higher

educational institutions (Norman & Ahmed, 2015). To allow the exploration of the phenomenon along with the identification of themes and explanation of patterns associated with these failures, sufficient detailed data needs to be collected. The present study makes a further attempt to integrate such observations in an overall conceptual framework, resulting in the development of an appropriate theory.

The literature available on ERP along with the research model of IS as proposed by DeLone and McLean helps to define the variables for measuring the success of an ERP implementation. Furthermore, the key success factor theory helps in explaining the reasons behind failures, delays, and resource overrun. The process model enables the researcher to identify which key success factors are important in the process model phases. The process model and key success factors will provide a useful guide for organisations planning to implement ERP systems. For this study it is better to consider the IS success model as provided by DeLone and McLean, as it helps to measure the success of implementation from various perspectives. Additionally, ERP systems are also a type of IS, Therefore, the research framework should allow for the combination and adaptation of the process model for success in ERP with the suggestions from the literature associated with success in ISs as shown in Figure 3.10. The results of the literature review emphasized the need for a model that was more effective and applicable for successful implementation of ERP by educational institutions in future. This conceptual framework presents the influential factors and prioritizes them according to their importance, while mapping these factors across the ERP implementation life cycle phases and stages.

When these measures of success interact with each other, they may give different results, but this is beyond the focus of the present study. Consequently, and in order to make it applicable to ERP systems, there is less importance placed on previous measures for system and information quality. This is because although the information output from the system may or may not satisfy the user they have to accept what the IS produces. As a guideline for the present study, the researcher has focused on the following research objectives:

1) Identification of the factors which influence the ERP implementation,

2) Prioritization of the factors according to their importance for the successful implementation of ERP,

3) Examination and mapping of the influential factors for different lifecycle phases and stages to achieve a successful ERP implementation.

4.3 Research Methods

4.3.1 Research methodological choices

A key strength of research work based on information systems (IS) is the diversity in the methods of research (Lee, 1999; Robey, 1996; Sidorova et al., 2008). The academics working on information systems use a plethora of different methods, categorised broadly as quantitative and qualitative research (Lee & Hubona, 2009; Myers & Avison, 2002). Although the diversity of methodology in the research of information systems is encouraging, there exists a dearth of studies in the field employing an approach where mixed methods are used, i.e., including qualitative and quantitative methods under a single inquiry of research. Such mixed methods help in developing a common scientific bias that is necessary for advancing and sustaining the diversity of methodologies for IS research and for the creation of a body of knowledge that is cumulative in nature (Lee & Hubona, 2009; Mingers, 2001, 2003; Weber, 2004). Under the present study, a selection of qualitative methodologies are made as illustrated in section 4.3.3. The methodological choice is depicted in Figure 4.3.

Figure 4. 3 Methodological choice

Source: (Saunders et al., 2016)

Quantitative Method

The method for quantitative study is a systematic investigation, conducted in an empirical form, of a phenomenon that is observable in nature and takes place via statistical, mathematical, or computational techniques (Bryman, 2006). Quantitative research is undertaken with the aim of developing and employing mathematical models, theories, and/or hypotheses associated with this phenomenon. The basis of this research method is the process of measurement as it offers a relationship between empirical observation and the mathematical expression of quantitative associations. Any data that is numerical in nature (e.g. statistical percentage) is termed quantitative (Yin, 2004), but should be unbiased and usually capable of being generalised to a larger group or population. On the other hand, the data is analysed by using statistics and expects the numbers to provide results that are unbiased and can be generalized to some larger group of population. This method of study is widely used in social sciences like psychology, economics, demography, sociology, marketing, community health, human development, gender, and political science. However, it is rarely used in anthropology and history. In the areas of mathematical sciences like that of physics, the research work is 'quantitative' by definition too with some differences in the use of this particular term (Tashakkori & Tedlie, 2010).

Qualitative Method

Qualitative research is a broad approach encompassing several methods of study. The objective or goals of qualitative study can vary depending upon the background of the discipline, such as a psychologist seeking to collect detailed information on behaviour of human beings and the reasons governing such behaviour. The methods of qualitative study explores the "why" and "how" of decision making, not just the "what"; "where"; "when"; or "who", with the possibility of a strong bias for certain fields like sociology, (e.g. for creating and understanding the programmes of government or social benefit). Various subject areas like political science, social work, and special education make use of qualitative research (Yin, 2014) for the understanding of a situation or phenomenon sometimes becomes possible only through detailed exploration of the situation in its total or whole form, often with access to large amounts of "hard data." It may start as an approach that is theory grounded in nature where the researcher may not have any earlier experience or knowledge of the phenomenon, or the commencement of study may take

place with propositions proceeding in a manner that is scientific in nature throughout the process of study (Bansal & Corley, 2011).

4.3.2 The Rationale of the Qualitative Research

There are several theoretical issues that the researcher has identified from the available literature in relation to perspectives, implementation, and analysis of cases of ERP implementation (as highlighted in Chapters 2 and 3). Specifically, the literature is limited to the clarification of key success factors and stages of the ERP lifecycle for the implementation of ERP in HEIs, more specifically in the Middle East. Therefore, this is the initial rationale influencing the researcher in the selection of the research approach for the study. Non-numerical data is collected and interpreted directly from the intended interviewee (Huberman & Miles, 2002). The modus operandi for the qualitative method is the collection of data where illustrations, decoding, and transformation overcome the conditions with the meaning.

Denzin and Lincoln (1998) view the method of qualitative research as multi-dimensional with several different methods which entail an interpretive and naturalistic approach to the topic. The term 'interpretive' research is used recurrently, and in an interchangeable manner, with 'qualitative' research in the available literature (Galliers, 1992). Hakim (2000) supported the arguments that highlighted qualitative research was employed for studies where the prominence was on the explanation and description of phoneme in comparison with those research studies which focussed on predictions. Hakim (2000) indicated that with qualitative research, perceptions and conventions, together with explanations and suppositions are theorised in literature. (E.g. positivism, post-positivism, and others associated with studies of social and interpretive subjects). Therefore, in this research with the aim of detailing the qualitative research, a comparative analysis is highlighted using quantitative research. This comparative analysis is used by the researcher to provide a more detailed justification for the selection of the qualitative method of research. The key rationale for selecting this particular method is the capability of the method to study and examine issues in their natural surroundings. Schutz (1967) and Denzin and Lincoln (1998) explained that the essence was to consider whether this particular methodology helps in understanding a particular phenomenon or a fact in relation to the

connotations that people in that natural surrounding bring to them and specifically, explore the behaviour of people as part of their daily life. The focus of this particular study is on the implementation of ERP in HEIs. The research based on dealings and activities of individuals in HEIs may be different from those in other organizational sectors as it is basically associated with the world of academics. Marshall and Rossman (1999), evaluated several types of study where the qualitative method of research was considered suitable. Some key examples of such types, that are associated with the needs of the present study research, are depicted in the following points:

- Conducting an investigation of the key success factors, prioritising the role of factors, lifecycle phases, and stages, and mapping the factors on the phases of the lifecycle;
- Conducting a comprehensive investigation of the sophisticated processes of business in relation to the implementation of an ERP system in the context of higher education;
- Conducting an investigation of a limited phenomenon that is observed or considered, i.e., in the implementation of an ERP system in HEIs;
- Facilitating the researcher with widespread agility whilst interviewing and observing the case study of the enterprise;
- Exploring the implementation of ERP in HEIs (i.e. Two Middle Eastern universities in Jordan) and building up pertinent theories from the pragmatic knowledge and acquired level of experience.

It has been suggested (Remenyi and Williams, 1996) that the application of qualitative methods when conducting research studies can be exemplified by individual and organizational participation in research studies which supports the approach taken as highlighted above. It is clear that quantitative methods of research generally prove to be unsuitable when it is necessary to differentiate between individuals or objects in the natural sciences. The discipline of IS research is associated with individuals, and therefore, any methodology employing quantitative methods of research should be familiar with the inconsistencies associated with the activities of individuals. Taking into account the epistemological standpoint discussed previously, the researcher has selected the qualitative method as the most appropriate approach for this research based on the following rationale.

The value of qualitative research lies in the contextual information or data that is collected from HEIs, requiring the characteristics of such organisations to be taken into consideration.

As pointed out in earlier sections, the nature of a qualitative study is multi-method. This makes it possible for researchers to make an appropriate plan to question the respondents resulting in more instinctive and pragmatic data that suits the present research study.

In Chapter Two and Three it is highlighted that the implementation of ERP in HEIs is not well researched, therefore, providing the researcher the opportunity to increase the body of this knowledge by carrying out a research study within Jordanian HEIs.

In this section, the researcher has given reasons to justify the selection of the qualitative method in order to acquire a better comprehension of the phenomenon under investigation. In the following section, an appropriate strategy for the research is presented in detail.

4.4 Multiple Case Studies

As per the view of Yin (2013), a case study helps in conducting an examination of the phenomenon to be investigated in its natural setting through the application of several data collection methods in order to gather information from all the participants. Under this method, no experimental control exists and flexible boundaries exist for the phenomenon.

In the present study, an exploratory form of research strategy is applied using the case study method, which investigates the factors that influence the implementation of ERP in HEIs. Exploratory case studies are constructive for the development of theory as they provide evidence to support the work of similar studies in the future. The rationale for selecting the case study method supported by the literature is summarized below:

- Case studies are the key tool to understand, extend, explore, and explain the subject under investigation, such as ERP in the context of the current study (Gay, 2009).
- Case studies are generally related to qualitative studies, as these are meritorious “to use in assessing a contemporary phenomenon within real life context when boundaries among phenomenon and its context are not clear” (Yin, 2013).

- Case studies have a clear and rich understanding of the research context and the required processes to be explored under the present study (Saunders et al., 2007, p. 139).
- The use of the case study method is favoured by the inductive and exploratory type of research as a pure method for developing theories (Gay, 2005).
- Case studies when designed in a proper manner have the capabilities of deriving strong results to challenge the existing literature and theories (Saunders et al., 2007).

The mentioned conceptions, richness of the phenomenon, and the extensiveness in relation to the implementation of ERP systems justifies the use of the case study strategy of research to be implemented under the present study focusing on HEIs (Yin, 2013).

For the case study strategy, a choice needs to be made between single or multiple cases. According to the wheel concept, the process of research is not straight or linear, but it is a recursive sequence of steps that are reiterated at different times in order to prove the rationale behind the practical stages that are associated with the theory. Further it is agreed that in qualitative research methodology, it is important to apply a series of formal actions, however, the series of actions are not restricted to the same period (Flick, 1998). Therefore, through multiple case studies, the recursive evidence from multiple cases are more feasible for the researcher to reveal the underlying theory (Yin, 2013). Taking into account the above points the multiple case option was the preferred choice for this research.

4.5 Empirical Research Process

A pragmatic research process is proposed by Jankowicz (2000) explaining that three sequential stages are important for an empirical research process, namely, research design, collection of data, and analysis of data. This current study follows a similar pragmatic research process (see Figure 4.4). The latter was completed in order to evaluate the conceptual model suggested in Chapter 3 and the research questions related to the ERP implementation in HEIs.

The first step of the process started with gathering background information about the topic, and this was followed by a critical review of the existing literature, followed further by the investigation and clarification of the research problem. During the literature review the researcher developed the research questions, which would then guide the research and

determine the focus of the study. This led to the development of the conceptual model in the third chapter which outlines the proposed empirical research. Cases providing empirical data were used to investigate the various facets of the conceptual model. Figure 4.4 provides an overview of the empirical research proposed. There were several sequential steps identified in the design of the research where explorations of particular aspects of the research context took place. This resulted in a conceptual model presented in Chapter three, highlighting the proposed research where the facets of the model are investigated by the use of the case study method. Later the design of research was transformed into a plan of procedure under the rationale of:

- Transforming the task of collecting data in a comprehensive and controllable manner;
- Assuring the collection of the required primary data and discarding any irrelevant information;
- Ensuring that the present research study used a particular plan for the achievement of goals;
- Following the conduit along which there exists a generation of relevant knowledge.

According to Marshall et al. (2013) qualitative interviews in IS studies should generally include between 20 and 30 interviews and single case studies should generally contain 15 to 30 interviews. Therefore, this research examined three case studies within the Jordanian context with 33 interviews.

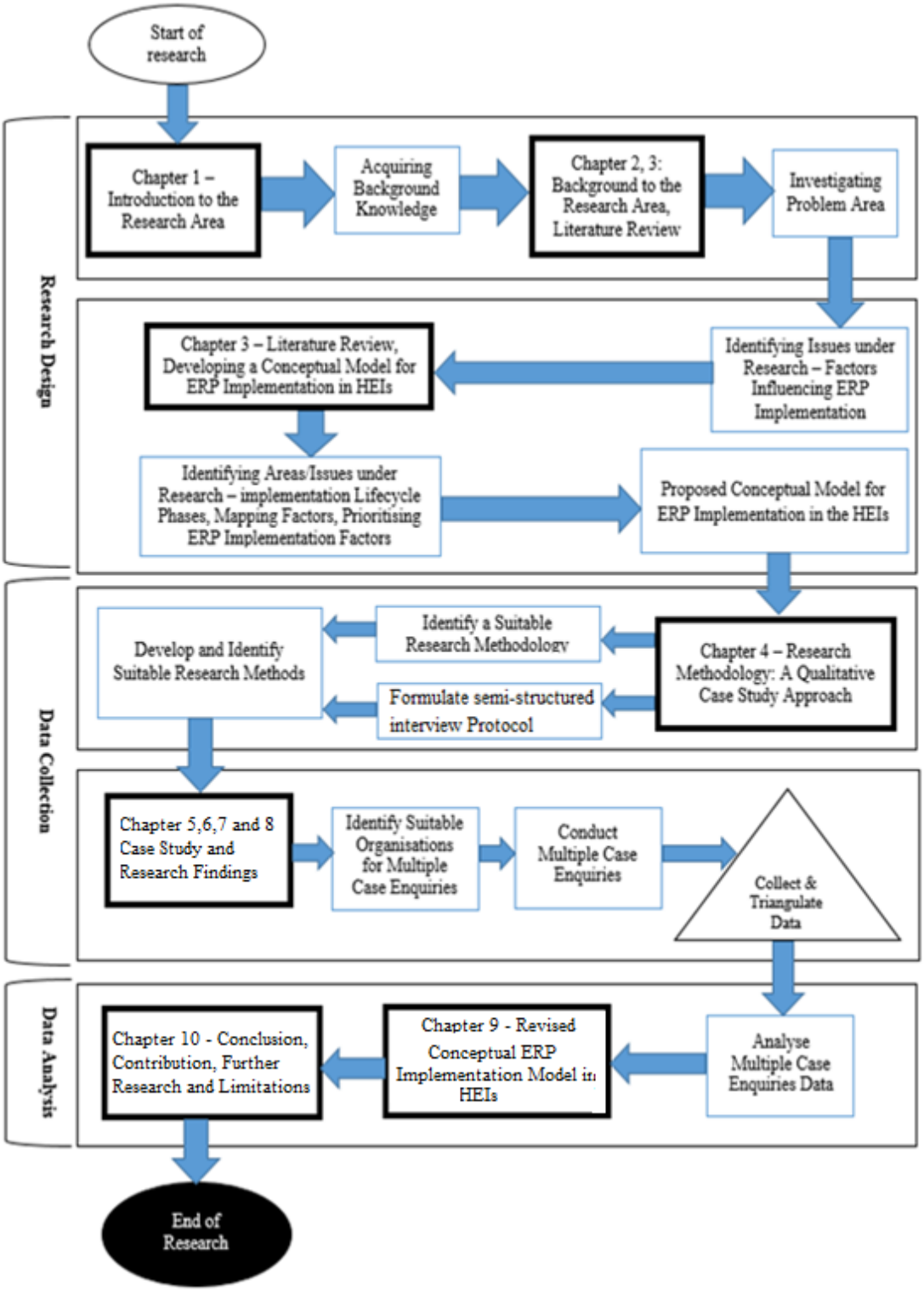

Figure 4. 4 Empirical Research Process

4.6 Data Collection

4.6.1 Data Source

There are several different methods of collecting data that are referred to as a source of evidence (Yin, 2013). The following Table 4.2 presents the various sources of evidence that help to explore a number of sources for the research.

Table 4. 2 Sources of Evidence: Strengths and Weaknesses and their Use in this Research

(Source: Yin 2013)

Secondary Data

The current research uses secondary data which is data that is already presented in published form on various online and offline sources. This data falls into both categories at it acts as an instrument of data collection and also presents multiple options of information collection for the researcher (Sekaran, 2003). The reliability and validity of secondary data depends on the source, its standard, and the state of the researcher. This data is the primary data collected by the other researchers for their research (Gray, 2009; Saunders *et al.,* 2016). Therefore, if the data is collected from a source that is trustworthy and the researcher has a high acceptance rate for the data and its findings then such data will be considered as reliable secondary data for other research.

The in-depth study of HEI leads to the development of the first theoretical model. The second phase involves the collection of secondary data. In this case, the secondary data sources used are academic books, ERP manuals used by vendors, online data, data from websites of government organisations, and trade reports. The list of sources are indicative and not complete as the process of adding sources goes on until the analysis is completed. The time taken and the cost

incurred for data collection is lower for secondary research than for primary research. However, the researcher may be overloaded by the amount of secondary information, some of which may not be needed which will increase the time required for the computation and analysis of data to draw meaningful conclusions (Flick 1998). It is obvious that the quality of this data has a significant impact on the findings of the research. For this research the use of the inductive approach means that a higher percentage of data will be collected from the secondary sources than the primary sources. In addition to this, the other benefits associated with secondary data is that it is easily available, accessible, relevant, and generally accurate (Gray, 2009).

Under the present study, secondary data is used as the first source of the case study evidence. Triangulation is achieved by collecting the data from various reliable sources, providing different points of view on the different aspects of the topic. Studying the case of the HEI helps to develop the initial theory. Secondary data is collected from the HEI cases and also from academic literature, vendors ERP manuals, trade reports, online databases, and websites of government organizations.

4.6.2 Sampling of case studies

In Jordan, there are 30 higher education institutions out of which 10 are public owned and the remaining 20 are privately owned. From these institutions, only three have implemented ERP systems and reached the post-implementation phase, of which two are public and one is private. Hence the overall population for the study are these three higher education institutions who have implemented ERP systems for their routine operations. In order to select a suitable sample from the population, it is most important that the sample should have characteristics which represent the overall population. The three higher education institutions are considered as true and sufficient representatives for the remaining population and so have been selected as case studies for this research.

The selected case study one (HEI_I), is a privately owned educational institution which has 8000 students while the second case study (HEI_II) is a public university with 47500 students. HEI_III, is publically owned but funded by the German government having a student count of around 5000. Hence, the selected sample has covered private and publically owned universities where differences could occur because of the way the university is funded or regulated which could

have an effect on the study making the results of the study more comprehensive. Additionally, the ERP implementation in all three selected case studies is at the post implementation stage which will cover the whole of the life cycle of implementation whereas none of the other universities have reached that point.

The data has been collected from HEI_I, HEI_II and HEI_III in Jordan, where the researcher will interview the participants in the study which will include directors, managers and senior technical staff at each university. The nature of the study limited the sample to those with sufficient experience of an ERP implementation.

4.6.3 Interviews

Interviews hold a special place in qualitative research as they act as the main source of evidence in case studies (Denzin & Lincoln, 1998; Gay, 2005; Yin, 2013). In the present research study, semi-structured face-to-face interviews were selected as the means of collecting information from the research participants. Informal discussions were conducted with senior manager technical staff and others concerning their experience in the various stages of the ERP implementation.

The semi-structured interviews provided the scope for flexibility in the research work where issues were well understood by the investigator and the respondents. Under the present study, three case studies were conducted with each case consisting of 11 interviewees. Initially, there were 25 to 30 potential participants, but at a later stage, the list was cut down to 11 interviewees when a better understanding of the participants and their knowledge of ERP implementation was gained. The 11 interviewees selected for the case studies comprised directors of IT, a project manager, IT module managers, and module managers. By selecting participants from a mix of disciplines as well as managers with a cross-functional responsibility a variety of results from different perspectives would be obtained.

4.6.4 Interview Protocol

The interview protocol used semi-structured interviews the questions being designed with the intention of meeting fully the objectives of the study. Two different sets of questions were used, one set for the top management and the other for the technical management and staff. Both of

the sets of questions varied according to the level of the participants within the organisation and their respective responsibilities. 4 of the questions were common to both sets. The interview developed for the top management of the institute had 15 questions (see Appendix B), whereas the semi-structured interview developed for the technical management and staff had 16 questions (see Appendix A).

Classification of Participants for semi-structured Interview Protocol

- ***Summary of Data Collection and Coding Process***

In order to collect the qualitative data from the sample participants of the university, a semi structured interview protocol was designed and developed for the purpose of collection of data. Two hierarchical levels were identified from the university's organisational structure. Therefore the participants were selected from each hierarchical level of the sample population, with different perspectives to as to obtain a more balanced set of results to further enhance the validity and reliability of the data collected. The semi-structured interview protocol was sub-categorized into two classifications as per the hierarchical levels in the universities; which were

- Top Management of the Higher Education Institute

This group included the policy-makers and decisions-makers for the institute who had the authority and responsibility to introduce and implement a system which will benefit the overall performance, productivity, and functioning of the institute.

- Technical Management Level Personnel of Higher Education Institute

This group included the Technical personnel who had the duty to follow the instructions from top management, and were responsible for the implementation of any new project or system, and were the users of that system.

Demographic details of participants for the purpose of data collection through the semi-structured interviews from the university, eleven (11) participants were approached and interviewed after their consent and willingness for participation in the study. For each of the participants, the code used for classification, their role in the university and their educational attainment is illustrated in table 4.3:

Table 4. 3 The demographic details, basic characteristics, and hierarchy level of participants

Classification Code	Position in University	Education attained case I	Education attained case II	Education attained case III
TM01	President	PhD	PhD	PhD
TM02	Vice President	PhD	PhD	PhD
TM03	Dean of IT Faculty	PhD	PhD	PhD
TM04	Human Resource Director	Master	PhD	Master
TM05	Finance Director	Master	PhD	PhD
TM06	Supply Chain Director	PhD	Master	Master
TL01	ERP Project Manager	Masters	Masters	Masters
TL02	ERP System Engineer	Bachelors	Bachelors	Masters
TL03	IT Director	PhD	Master	PhD
TL04	Technical Advisor I	Master	PhD	Bachelors
TL05	Technical Advisor II	Master	PhD	Master

4.7 Data Coding and Analysis

4.7.1 Assumptions for Data Analysis

The methodological assumption considered for the case study was the provision of accurate responses by the participants in respect of ERP implementation in their higher education institutions. It was also assumed that the responses were true, according to the best knowledge of the participants and the opinions or observations presented were the true representation of their perceptions. Furthermore, it was assumed that the open ended question approach adopted by the semi structured interview protocol will not skew the results from the data and that the empirical findings from the analysis will be unbiased.

4.7.2 Data coding

Qualitative data collected through the semi-structured interviews was coded and assigned for the purpose of analysis using pre-defined constructs. These constructs were termed sections, and the analysis was designed to draw out the findings under the umbrella of these sections. The sections were derived from the research questions of the study and the research questions of the study were representative of the objectives. The sections were used by the nVivo software as reference points to help organize, analyse and find insights from the data obtained. The pre-defined constructs or sections for analysis purpose were:

Section 01: ERP Implementation

Section 02: Factors for Successful ERP Implementation

Section 03: Challenges in ERP implementation

Section 04: Issues in Use of ERP System

Section 05: Evaluation of ERP System

4.7.3 Content Analysis technique

This data was presented in the form of answers given by the participants to the questions asked by the researcher. Data thus collected was then transcribed into a specific format so that it could be coded and categorized. This step means that the data was further broken down into smaller units where its elements, such as structure and theme, could be easily determined. In qualitative data analysis, the data is not only described but also explained according to the components of the theory, and the association between the various concepts is sorted leading to the classification of data for the creation of new linkages (Gray, 2009). In this research, the content analysis technique was used for the classification of interview data using the NVivo software. The following steps for content analysis were highlighted by Flick (1998):

- Summarising the content analysis: Similar text is grouped together and the data that is less relevant is eliminated.
- Explicating the content analysis: The terms presented in the data are defined.

- Structuring the content analysis: In this step a formal structure of data is identified and the theme observed in coded data is presented.

Content analysis is a very efficient method to analyse qualitative data gathered from the interviews. However, it does not provide any association between the variables considered in the research (Gray, 2005). Qualitative analysis consists of first understanding the language, and then the regularities and irregularities within the data are discovered and the meaning of the text and actions are derived. This makes it easy for the researcher to analyse data in a systematic manner which simplifies further interpretation and application of the theoretical concept (Saunders et al., 2007). Therefore, because it is one of the most appropriate methods used for analysis, this research has selected the content analysis technique for the qualitative analysis of interview data. However, the research did not need to be coded as the agenda for the interview was in detail. The researcher used content analysis for propositions made during the research, the researcher used content analysis and the feedback given by managers when reviewing the case study was discussed.

4.7.4 Using NVivo 11 Software (Pro Version)

The semi structured interviews conducted with the participants were transcribed and used to identify the themes and sub themes which emerged from the responses. A manual approach was used to identify the themes and subsequent sub themes from the data. Themes of the study were aligned to the objectives and research questions which were focused on the factors, challenges, evaluation, and success of ERP implementation.

For the purpose of analysis and identification of themes and sub themes, support from NVivo 11 software was sought to achieve the desired objectives. NVivo is used for qualitative data analysis and was designed by (Tim Richards, 1999) and is commercially developed by QSR international. NVivo is helpful in analysing rich texts as well as multimedia data for example charts, graphs, pictures, audios, videos, etc. A few of the functionality advantages of NVivo in qualitative research are;

1) NVivo assists in the organisation and classification of non-numerical un-structured data and data can be sorted and arranged to get the similar patterns. NVivo also provides the feature of

relationship linkages between different sets of data and different theories, so that trends can be analysed by a researcher or analyst in multiple ways

2) Research methods such as networking and organisational analysis, action based research, discourse analysis, ethnography, phenomenology, content analysis, grounded theory, and mixed method researches are supported and facilitated by the different features of the NVivo software

3) Different format of data are supported in NVivo for instance audio, video, pdf, word, digital photos, social media etc. Transcription services are also provided by the software which can be utilized to convert the recorded interviews or audio data into written documents for analysis and identification of themes.

Coding of data can be done through an automatic coding system which is a helpful and time saving feature. Uploaded narrative data can be accessed through One Note for future references and fast accessibility. Thematically grouped data can be presented in narrative as well as tabular form with the integrated support from quotes of participants and relevant literature. Pattern matching logic from the utility features of NVivo is used to identify the major elements from the rich text. This included the influential factors for the success of ERP, to perform the qualitative content analysis on thematically grouped interview data provided by the participants of each case study.

4.8 Reliability and Validity

The case study approach can have construct validity, internal validity, and external validity (Tellis, 1997). Construct validity is mainly linked with the subjectivity and biasness of the researcher which can be enhanced and improved by using more than one source of evidence to establish and prepare a chain of evidences which can lead towards the preparation of draft case study report and this report can be reviewed and assessed by the key informants (Yin, 2013) as summarized by Tellis (1997). Internal validity of the current study was maintained by ensuring: the research questions of the case study are clearly written appropriate propositions are given and the research questions are authenticated; an appropriate case study design has been adopted as per the research questions of the study; meaningful and purposeful sampling strategy/strategies are being adopted; systematic collection and management of data is ensured;

and correct analytical technique/techniques are applied on the data to get the results (Baxter & Jack, 2008).

Similar properties and characteristics for qualitative research stated by Yardley (2000) were:

- Sensitivity to context; commitment and rigour; transparency and coherence; impact; and importance. These characteristics were further elaborated by Shinebourne (2011, p. 26) in these words: sensitivity to context is related to the link with theoretical literature, socio cultural context, perspective of participants and their experiences so that the rationale can be adopted for the selection of method and detailed description can be provided while analysing the raw data and quotes from the participants can be presented to authenticate the results and findings;
- commitment and rigour can involve an extended participation and captivation in the topic for the purpose of complete understanding of the cases and thorough knowledge of the details c) transparency and coherence can be obtained with the help of clarity and detailed description of research process stages in terms of sample selection, scheduling of interview, interview questionnaire protocols and various stages of analysis.
- In order to ensure the transparency; arguments must be unambiguous and non-contradictory in nature so that the results can lead towards the answering of research questions and understanding the different perspectives of the study
- Impact and importance are the important factors to be considered for the maintenance of interest and attention of reader in the research work.
- Finally, the external validity of the case study can be achieved by explaining the generalizability of the results and its application in different scenarios (Tellis, 1997).

The internal validity and credibility of the study was ensured because of the nature of interaction with participants as extended personal interviews were conducted with the participants which also required follow up questions during the interview session. Also, the participants examined their own interview transcripts for errors and omissions and any required changes. Therefore, the small sample size faced the issue of saturation as the themes and phenomenon were presented to the participants repeatedly. In multiple cases it was important to understand the link between the historical and cultural background and the targeted objectives for each case

description. Process descriptions, schedules and proper protocols were applied to make the transcriptions which also enhanced transparency and helped at various stages of data analysis to make a replicable research design (Cavaye, 1996). The exploratory multiple case study design assisted in the imitation of the research rationale at multiple higher education institutions and helped the researcher to matching the patterns across these institutions. This process provided limited internal validity. The selection of multiple higher education institutions and diverse participants helped to improve the applicability and generalization of the results for other educational institutions.

As recommended by Yin (2003) the reliability of the research was assured by the utilization of interview protocols, the overview of case study project, the procedural protocols to be followed in the field, the questions in the case study, and the outline of the case study report. Support from an expert linguist increased the reliability of the findings when language was a problem. This should achieve an in-depth understanding of the different opinions of the participants when extracting the findings for the analysis of the data.

Triangulation is a confirmatory technique which includes “the process of corroborating evidence from different individuals (e.g. a management level and a technical level), types of data (e.g. interviews), or methods of data collection (e.g. documents and interviews) in descriptions and themes qualitative research” Creswell, 2012, p.259). Pilot study was not applied due to the limited number of interviewees who were asked to provide their feedback for the questions as part of the interview protocol. The feedback provided by the participants helped to make adjustments to the wording of the interview questions improving understanding and assuring valid and relevant answers. According to the literature triangulation is achieved by comparing the evidence from multiple sources (Leedy and Ormrod, 2010; Yin, 1994; Yin, 2013). In this research Triangulation will be achieved by comparing: the responses and results of three case studies; publically available information about these case studies as the documented and authentic resource; and the findings of previous related literature in respect of ERP implementation experiences in various higher education institutions.

4.9 Research Ethics

The norms of high-quality research have been proposed by Gratton and Jones (2010); these norms should be methodically opined as per ethical concerns. Furthermore, it is perceived that all researchers irrespective of research design, sampling, and choice of method should categorically abide by ethical norms (Gratton & Jones, 2010). The ethical norms for research purpose were established by Cooper and Schindler (2006), postulating that the researcher should have a clearly defined purpose for both the research and data analysis. The researcher proposes to follow these norms and will accept the clause of confidentiality with respect to participants and associates of the research work (Cooper & Schindler, 2006). Furthermore, the researcher proposes to abide by the following ethical considerations as established by May (1997):

- The researcher understands the responsibility towards the society and would like to maintain the societal norms in the research.
- The researcher will obtain the consent of the participants to be questioned in the interviews and to publish the responses.
- The researcher will be responsible for all the queries regarding this research and will answer questions with all sincerity.
- The researcher proposes to maintain the level of professional decency which may be required to maintain the ethical code for this research (May, 1997).

The ethical requirements set by Coventry University approval being given by the institution under Clearance ID P50975. Every effort has been made to avoid plagiarism of published material with acknowledgement being given to the original authors.

4.10 Chapter Summary

This chapter presented the rationale for the selection and justification for the use of an appropriate set of research methods. The research methods chosen provides the researcher with a framework for the research design. The researcher has justified the selection of each method in terms of research philosophy, approach, strategy, data collection, and data analysis. The selection was to adopt a multi method approach which included an interpretivist philosophy, inductive reasoning, and a case study research strategy. The study will be performed using both secondary and primary research. The data for the primary research will be collected by interviews, and the data for the secondary research will be collected from various reliable published sources. The analysis will be carried out using qualitative data collected to provide answers to the research questions.

CHAPTER 5 FIRST CASE STUDY (HEI_I)

5.0 Chapter Overview:

The research context was justified in chapter two, a conceptual model was then proposed in chapter three for ERP implementation in the higher educational sector, then the research methodology adopted to carry out the current research was explained in chapter four. Further validation was required to ensure the maximum possible credibility of the research work. This chapter of the thesis elaborates the implementation of an ERP system in Jordanian HEIs by utilizing the research methods which were designed in accordance with the proposed conceptual and theoretical frameworks (see Figure 3.12). For this purpose, the empirical data collected through the primary and secondary sources from three Jordanian universities was analysed to draw out the findings and conclusions. Eleven participants were approached and interviewed after their consent had been gained and their willingness for participation in the study demonstrated. In this chapter the findings for the qualitative analysis will be presented. The present qualitative case study had the basic aim of assessing the successful implementation of ERP system in Jordanian HEIs. In order to achieve the aim and research questions of the study, objectives were defined to identify how the questions would be answered.

5.1 Introduction to HEI_I

HEI_I is a private institute for higher education in Jordan. It has a campus with a friendly environment and almost 8024 students from different areas of Middle East who have been enrolled in undergraduate and post graduate programs offered by the university in different courses of study.

HEI_I made an agreement to adopt "specialized ERP systems". The basic purpose of this agreement was to achieve improvements in educational standards and outcomes, by designing and preparing instructional plans and training courses for the students and faculty members of the institution and by providing skilled graduates to address the needs of the labour market. HEI_I was given the mandate to provide a specialized and custom-made ERP system according to the requirements of the university. Other universities from the Jordan are also updating their IT systems to enhance the quality of their education provision and enable them to compete at international level.

5.2 ERP Implementation in HEI-I

The first section presented the views and understanding of the participants regarding the prevailing ERP system in the HEI_I. This second section addresses the questions: what ERP system is being adopted? Why was it the preferred choice and what processes were involved in its adoption? This is in response to the first research question of the study, which was: How can ERP systems be implemented successfully in HEIs. The themes for the section were identified by the questions from the semi-structured interviews while the coding of the responses from the interviews gave birth to the emerging sub-themes (referred as parent nodes and child nodes in NVivo outputs). Table 5.1 shows the themes and sub-themes defined under this section. Discussion of the themes and sub-themes follows:

Table 5. 1 Themes and sub-themes from NVivo output

Themes (Parent Nodes)	Sub-Themes (Child Nodes)
ERP System Used	• System Information • Objectives • Users
	• Overall Performance

Reasons for ERP Implementation	• Integration • Planning and Control of Inventory • Interactions
Strategy to Adopt ERP System	• Approach (Big-Bang)
Change Management Strategy	• Human Elements • Incentives • User's Education • Ignorance of Issue
Training for ERP System	• Basics of Training • Response of Staff

All the themes and sub-themes under this section are discussed as under;

5.2.1 ERP System Used

Participants were asked to provide basic information regarding the ERP system being used in the HEI (HEI_I). This is the second ERP system that was implemented in the HEI because the previous system was a total failure. This theme was further categorized into sub-themes which are represented by NVivo in Figure 5.1:

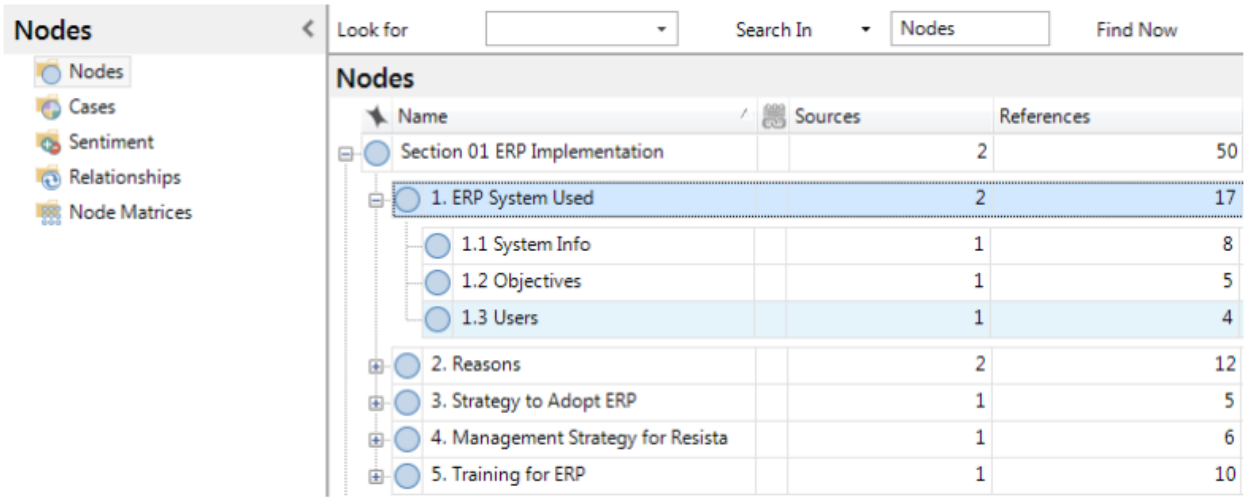

Figure 5. 1 ERP System Used which are represented by the NVivo

To provide information from different perspectives both top management and technical staff were involved as participants in the interview process.

❖ **System Information**

Only technical level respondents were asked about the basic specifications of the ERP system being used. All of the technical level participants (n=05) provided the same basic information about the ERP system. For example, TL 04 commented,

"*Currently Microsoft Dynamics ERP system is being implemented in the HEI_I and this ERP system has been adopted since 2012. At present, the system is in its post-implementation phase*."

❖ **Objectives**

The aims and objectives of the ERP system were assessed and answered by the top management of this higher education institute. The pre-defined objectives were used to assess and evaluate the implementation of the system. The basic objective of the ERP implementation was to improve the overall performance of the HEI by engaging with the instructional materials and training programs for the benefit of both students and faculty members.

This basic aim of the ERP system implementation was quoted by the TM02 in these words,

"*The basic aim and objective of the ERP project are to develop the instructional material plans and training programs for the students and faculty members, in order to enable the university to raise the level of educational outputs, to conform to the requirements of the labour market. These aims and objectives have come directly from the business strategy*."

❖ **Users**

The analysis of the responses under this sub-theme showed that the responses came from technical level personnel. All of the participants were of the view that the primary users of the ERP system were HR, Finance, and Logistics staff. For instance, TL02, TL03, and TL04 said,

"*Staff members from Human Resource Department, Procurement and Logistics Department, and Finance Department are the primary users of ERP system*."

5.2.2 Reasons for ERP Implementation

The second theme for the transcript of interviews was the reasons for ERP implementation. Participants of both levels (Top Management and Technical Level) were asked about their perceptions regarding the facts why HEI_I has adopted this ERP system. There were four basic reasons given by the participants which were classified as the sub-themes. The presentation of parent nodes and child nodes in NVivo is shown in Figure 5.2:

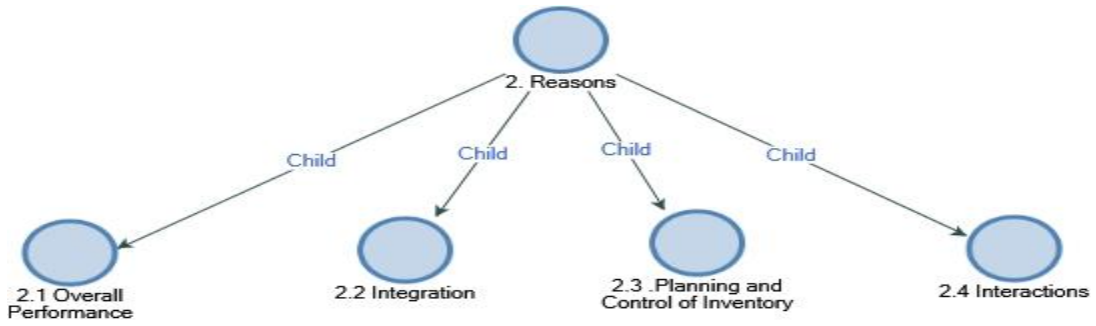

Figure 5. 2 Reasons for ERP Implementation sub-themes which are represented by the NVivo

According to the views of TL04 and TL05,

"Four basic reasons were mentioned, which were:

- Enhancing internal business operational activities
- Improving organizational performance
- Reducing IT and Labour costs
- Enhancing and building positive relationships between the workforce and external organizations.

The analysis and explanation of these emerging sub-themes is explained below:

❖ **<u>Overall Performance</u>**

All of the participants gave the reason for the introduction of the ERP system was to improve the overall performance of the institution, which was a private university and a business entity for its shareholders. The analysis showed that top management as well as the technical staff were of the view that the ERP system had been adopted to improve business performance. As quoted by TM04:

"The basic reason for the implementation of ERP project in this institute is to improve the overall business performance. Given that ERP system is recognized as a business instrument, there is a need to understand its function in undertaking and supporting business processes and transactions."

Similarly, a member of the technical staff TL01 was of the view that,

"*The ERP system was introduced to improve the overall performance of the business.*"

❖ **Integration**

The ERP system can be used to improve the internal processes of the business by integrating the processing of different departments in a unified and accessible database. The analysis of responses revealed that respondents recognized this as one of the reasons for the implementation of the ERP system. As per the words of TM05,

“The ERP system can enhance productivity because the ERP system adopts and incorporates data processes across various departments located in the same network. This enables the University to execute and process orders efficiently and move products in a timely manner.”

Similarly, technical staff TL02 and TL03 were in agreement,

"The reason for the implementation of ERP was the integration of all functions and operations into a central database to improve the productivity of the business."

❖ **Planning and Control of Inventory**

Another sub-theme which emerged was the management of the warehouse and inventory. In an organisation, the planning and management of inventory are considered as the most important feature in evaluating the efficiency and overall management of operations. The analysis confirmed this as a reason for implementation of ERP. A participant from top management TM06 said,

“The reason for ERP implementation is to enable accurate material planning and control of inventory as ERP creates efficiencies.”

❖ **Interactions**

It was mentioned by participants from top management of the university that the ERP system can be used as a tool for interaction and coordination. Responses analysed that one of the reasons for the implementation of ERP was to improve and enhance interactions between different stakeholders. As per the words of TM02,

"The ERP project was implemented in HEI_I to provide a platform for academicians, researchers, professionals and decision makers who are interested in the areas of Information and Communication Technology (ICT)."

The content analysis of the responses identified the sub-themes as overall performance improvement, integration, planning, and control of inventory and interactions. The word-cloud extracted from the NVivo 11 software also highlighted the same sub-themes. It can be seen from the word-cloud that performance, productivity, improving business processes, and internal control were most frequently used when referring to this specific theme.

5.2.3 Strategy to Adopt ERP

Under the theme of section 01, participants were asked about the strategy which was adopted to implement the ERP system. The interview questions on this theme were only given to Top Management. The NVivo screenshot showing the theme and its sub-themes are shown below:

Figure 5. 3 Strategy to adopt ERP system sub-themes which are represented by the NVivo

❖ **Approach (Big-Bang)**

All of the top management participants confirmed that to implement the ERP system the Big-Bang approach was adopted. As per the words of TM03,

"Th Big-Bang Approach was adopted which was easier for integration and reporting."

The participants said that the Big-Bang approach implemented the ERP system in all business units at all locations at the same time. According to TM01,

"For the purposes of ERP implementation, the Big-Bang approach was adopted which is a direct ERP approach where all functions and processes, precisely, the ERP modules such as; logistics, human resources, procurement, accounts, and finance are implemented and processed simultaneously from different geographical locations but on the same network."

Some of the benefits and advantages of this approach were listed by the participant from top management; these advantages included cost effectiveness, timeline management, capital and human resource investments. TM05 quoted,

"The *Big-Bang Approach was adopted to implement the ERP system, which included:*

- *Faster implementation timeline,*
- *Shut-down of old system,*
- *Use of new system by entire organization at the same time,*
- *Lower cost of running systems,*
- *High capital and human resource investment."*

5.2.4 Change Management Strategy

Management had to adopt a strategy to handle the resistance shown by the users of the ERP system. Attempts were made earlier to adopt a system, but those attempts failed because of the inappropriateness of the ERP system for educational institutions. . Some of the strategies pointed out by top management were classified as sub-themes. The classification of parent nodes and child nodes in NVivo is as under:

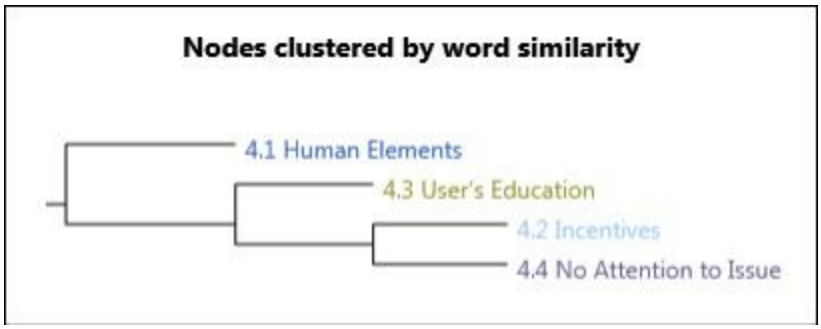

Figure 5. 4 Management Strategy for Resistance sub-themes

Human Elements

The analysis of the responses from top management showed that one of the strategies adopted to tackle the issue of resistance in the process of ERP implementation was to give consideration to the human element. It was expected that all employees would show some form of resistance. Every employee of an organization has unique characteristics which affects their organizational abilities in different ways. This aspect of human nature and characteristics was explaine by TM02 as,

"Change is usually met with resistance and in this context, there is no exception. Similarly, it is anticipated that given their line of duty, employees will be resistance to change adopted at a particular point. There are different factors that promote and motivate fear and other aspects that enable employees to function in an organization. Recognizing the sources of resistance enables the structuring of strategies through developing an appropriate organizational change management plan to address identified human elements restricting the change and fostering the resistance."

- **Incentives**

Analysis of the responses showed another strategy to tackle the resistance against the use of ERP system was by providing incentives to users to encourage their acceptance of the new system. These incentives were in monetary form as well as in the form of professional growth and development. As stated by TM05,

"Management tackled the phenomenon of resistance to change for the use of ERP system by offering bonuses and overtime to the staff members who were ready to learn more about the ERP system."

It was observed in the analysis that these incentives influenced the performance of the staff members, this improvement in performance was quoted by the TM03 as,

"More benefits and bonuses to the staff provided by the management have increased the individual performance."

- **User's Education**

Every new system needs some training and basic education for better understanding of the different features and functions of the system. This aspect was highlighted by top management which showed that the training and education for the ERP system was used as a strategy to handle the resistance to change. The training and education given to the staff removed their fear of change and encouraged them to learn more about the system. This was reflected in the response of TM04 as,

"The management had "To migrate to a structured program and provide the users with guidance and attribute guaranteed benefits of the adopted system.". Intensive courses were offered to the users for their education and understanding of the new system."

- **No Attention to Issue**

Paying no attention to an issue can also be used as a strategy. The responses from some of the top management respondents revealed that this strategy of 'No Attention' was adopted by the management of the institution to settle the issue of resistance. According to TM06,

"Management did not pay much attention to the issue of resistance to change shown by the users or staff members for the adoption of the new ERP system."

This strategy led to the forceful acceptance of the change brought by the implementation of the new ERP system.

Figure 5. 5 Management Strategy for Resistance word Frequency Test

This responses of management showed that the strategies adopted, were consideration for human elements, incentives, user education and no-attention. The word-cloud extracted from the NVivo 11 software also highlighted the same sub-themes which were: management, benefits for employees, resistance by employees, and change.

5.2.5 Training of ERP System

This theme, derived from the responses of top management was that every new system requires basic education and training for users. As the ERP system was new for the staff members of the institution, the management provided training courses to make them familiar with the new system and train in the use of the different features. Sub-themes emerging from the responses of the participants for this theme were:

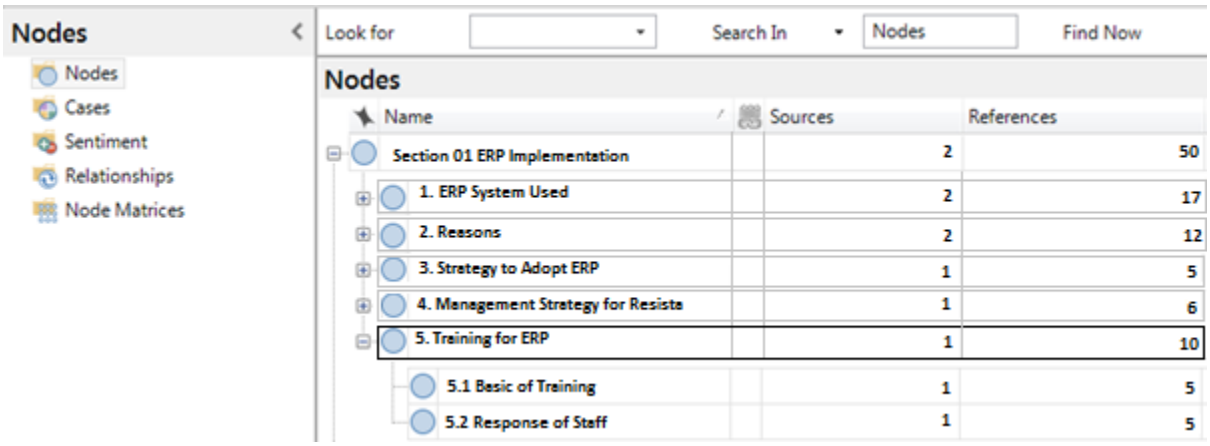

Figure 5. 6 Training of ERP System sub-themes

❖ **Basics of Training**

All of the respondents gave similar responses to the question regarding the training which was provided to the users. Analysis showed that staff members of the institution were given three weeks training which was given by the vendor of the ERP system. As mentioned by TM01, TM02, TM03, TM04, TM05, and TM06,

"Three weeks training was provided by the vendor of the ERP system."

❖ **Response of the Staff**

Training was arranged by the management of the institution for the users of the new ERP system. The response of users towards the training can play a crucial role for the successful implementation of the ERP system. Most of the respondents from top management were of the view that three weeks training was not sufficient, and the staff members were not satisfied with such a short course. TM03, TM05, and TM06 responded,

"The response of the staff towards the training of ERP was not satisfactory because they needed more than three weeks of training."

The evaluation of the training course showed that the pre-defined goals were not achieved the main reason for this failure was the limited time for training. As per the words of TM01,

"Traditional ERP training courses do not achieve their intended objectives because they do not put into context changes that employees can easily comprehend and understand, supporting changes over a long period, and the provision of diverse learning styles."

5.3 Key Successful Factors for ERP Implementation

This second section addressed the second part of the first research question which was: What are the key success factors influencing the effective implementation of ERP systems in HEIs. All the participants of the study, whether from top management or technical staff were asked about their views for identification of the factors that lead to successful ERP implementation.

The themes for this section were identified by the questions from the semi-structured interviews while the coding of the responses from the interviews gave birth to the emerging sub-themes

(referred as parent nodes and child nodes in NVivo outputs). The themes and sub-themes are shown in table 5.2.

Table 5. 2 key success factors for ERP sub-themes

Themes (Parent Nodes)	Sub-Themes (Child Nodes)
Technical Factors	• IT Infrastructure • System Quality • Information Quality
Organisational Factors	• Change Management • Training and Education • Organisational Culture • Business Process Reengineering
Project Support System Factors	• Top Management Commitment and Support • Qualified IT Staff • Vendor Relations
Project Factors	• Project Management • Budget • Time • Right ERP System

Detailed explanation and analysis of each theme and sub-theme are given below:

5.3.1 Technical Factors

All the participants of the present qualitative study stressed the importance of technical factors for the successful implementation of the ERP system. Top management as well as technical staff. emphasized an important success factor as being the availability and maximum utilization of technical resources. The important technical factors from the responses were classified as the sub-themes. The NVivo representation of these sub-themes is shown in Figure 5.7.

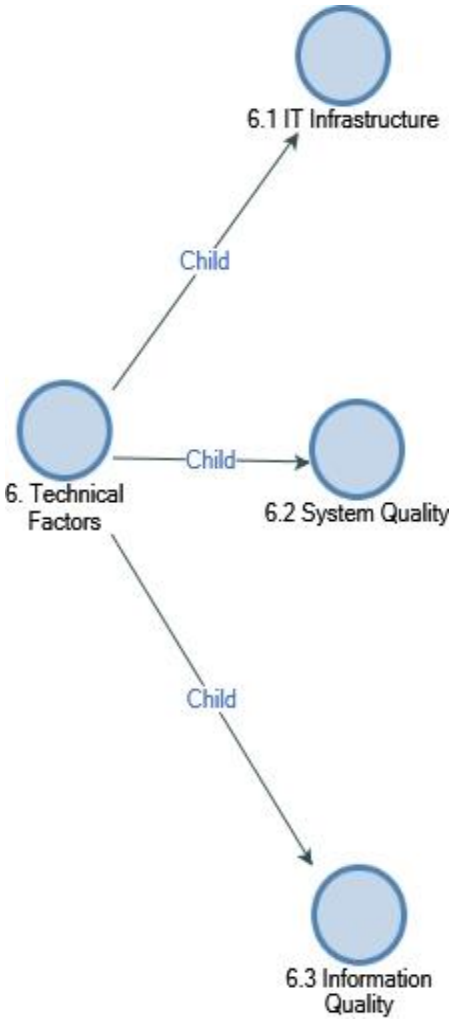

Figure 5. 7 Technical factors sub-themes for successful ERP implementation

❖ **I.T Infrastructure**

In order to implement an ERP system in an educational institution, the availability of technical resources and their best utilization can be considered as the key factor. The need for a suitable IT infrastructure which is kept up-to-date cannot be ignored. Top management and technical management identified that the IT infrastructure and IT support was essential for the implementation as well as the post implementation phase of the ERP system. As per TM03,

"In order to implement the ERP system at its fullest, the organization must have the updated IT infrastructure which can support the smooth running of the system."

For an implemented and running system, continuous maintenance and support are needed on a daily basis to enhance the operation of the system and improve the overall productivity of the organisation. For example, TL04 stressed,

“Day to day technical support and maintenance is required after the implementation of ERP system. If such support is not provided at the right time, the successfully implemented ERP system can become a failure and ineffective.”

- **System Quality**

It was mentioned earlier that this is the second implementation in this university because the first ERP system was unsuitable for an HEI. The quality of the ERP system is also an important factor in the success of ERP implementation. If the quality of the system is not up to the mark, then it can be very difficult to achieve the pre-defined goals and objectives for the ERP system. The quality of the new ERP system was recognized as fair enough but it was not the best. The management of the university is striving to achieve the best quality of the system to enhance the productivity of the organisation. As per the views of TL03, TL04, and TL05,

"Although the quality of the ERP system is good enough the IT staff consider that is isn’t and they are constantly looking for improvement."

- **Information Quality**

Another sub-theme which emerged from the technical factors was the quality of information. Any information which is needed to be input in the ERP system must be according to standards and set protocols. The quality of the information can influence the success of the ERP implementation. A participant from the technical level stressed the importance the quality of information by stating that,

"A very important technical factor which can affect all modules of ERP system is the quality of information. Effect of this factor is retrospective and can hinder the successful implementation of ERP system as well as the achievement of specific goals and objective.”

5.3.2 Organisational Factors

There are some general features for every organisation, and also every organisation exhibits some unique characteristics which make that organisation distinctive in the organisational community. Organisational factors relate to the progress and development of an individual in an organisation as well as the growth of the organisation and achievement of its goals. The relevant sub-themes which emerged under organisational factors for the successful implementation of ERP were:

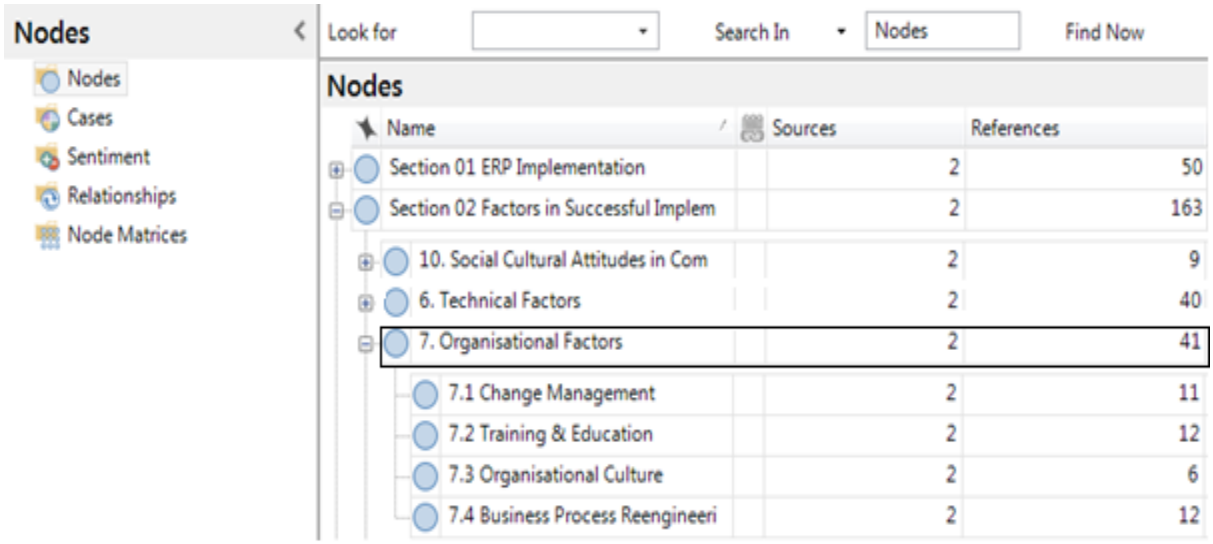

Figure 5. 8 Organisational factors sub-themes for successful ERP implementation

❖ **Change Management**

Implementation of any new system requires change. The management of change can help in the successful implementation of ERP. In order to introduce change, proper management and planning is needed within the organisational structure. According to the participant from the technical level hierarchy TL02,

"Within an organisation proper and appropriate management of change can hinder the ERP from achieving its goals."

❖ **Training and Education**

In order to update the users with the new and advanced technologies, on-the-job training and the updating of existing knowledge can be considered as a key factor for the personal growth of the individuals as well as the organisation. Analysis of the responses revealed that training and education can play a vital role in the successful implementation of the ERP system and the achievement of pre-defined goals and objectives to improve the overall performance and productivity. Technical level participant TL03 highlighted that,

"Extra training for the IT staff is required to improve the organisational success of the ERP system."

❖ **Organisational Culture**

Managing the organisational culture can be termed as the driving factor for the growth and development of the employees of that organisation. The responses of the participants revealed that encouraging the use and adoption of the new ERP system can be achieved by promoting a healthy and positive culture. This sub-theme was considered important for the success of ERP system in the organisation of higher education institution. For instance, the TL04 participant responded,

"In particular, organizational culture provides employees a common frame of reference for changes in an organization. When organizations have different cultures, people have different perceptions and interpretations of organizational changes, which affect employees' embracing changes. Therefore, organizational culture is known to be important for the success of projects involving any organizational changes"

❖ **Business Process Reengineering**

In order to incorporate a new system, the need arises for the re-engineering of the different processes of the organisation. Analysis showed that implementing a new system creates the need for changes to the way the business operates. These needs should be addressed and catered for during both the implementation and post implementation phases. According to the words of TL05,

"Implementation of the new ERP system can get affected and results can deviate from the predefined aims if the business processes of the organisation in which the ERP is supposed to be implemented are not reengineered according to the new demands and requirements of the new system."

In summary, all the participants indicated that organisational factors can affect successful implementation of the ERP system. These organisational factors were highlighted by the participants, which they elaborated in the form of sub-themes.

5.3.3 Project Support System Factors

It was shown earlier that the end users of the ERP system were staff from HR, Finance, Procurement, and IT staff. The theme of section 02 identified those factors associated with the users of the ERP system who by effective and efficient use of its functions make a system successful. Some important emerging sub-themes identified by the respondents were shown by the NVivo software which were as follow:

Figure 5. 9 System Support factors sub-themes for successful ERP implementation

❖ **Top Management Commitment and Support**

Respondents gave their perspective that the implementation of any new system cannot be categorized as a one day process or a short term job. But in practice, implementation of a system is a continuous process because, after completion of one phase, another phase gets started. Therefore the commitment and support of the top management of the HEI is required to make the adoption of the new ERP system a success. The top management of the organisation are end

users because they are supposed to make better decisions in the light of the results drawn from the implementation of the new system. As suggested by the top management participant TM04,

"The ERP system can be used to get assistance in the decision-making process. Therefore, throughout commitment and support of the top management is required so that they can get maximum accurate results to make more aware and effective decisions for the development and performance of the organisation."

- **Qualified IT Staff**

Participants were of the view that maximum utilization of the ERP system can be achieved if the end users of the system are competent and qualified to use the system. Whether the participants were op management or technical staff, they all gave the unanimous view that no system can give its best without the support of its users. Qualified IT staff are in a better position to trace the shortcomings or discrepancies in the system. Similarly, errors in the input of information or processing can be rectified at the right time by qualified IT users of the system. Participant TL04 stressed that,

"Successful implementation of the ERP system cannot be achieved without the appointment of competent and qualified IT staff, which are basically the users of ERP system and can be questioned about the success or failure of the system."

- **Vendor Relations**

In an HEI, vendors are approached to provide an ERP system which meets the demands of the institution. Participants gave their view that a cooperative relationship between the institution and vendor can help in the successful implementation of the ERP system. According to TL02,

"Vendors of the ERP system must be approached to impart the training to the users of the ERP system if required."

Another member of the technical staff highlighted the fact that,

"Training of the ERP system was considered as insufficient, so the institution must utilize its association and relationship with the vendor to enhance the training of ERP system users."

5.3.4 Project Factors

Implementation of an ERP system is a project, which should be planned, implemented, and assessed as a project. Participants gave their views about the possible factors which should be considered when implementing an ERP system for the improved performance of an HEI. This theme addressed the basic components of a project such as management, finances, resources, time, and making right decisions etc. These factors are discussed and analysed under the emerging sub-themes. NVivo presentation the theme and sub-themes as:

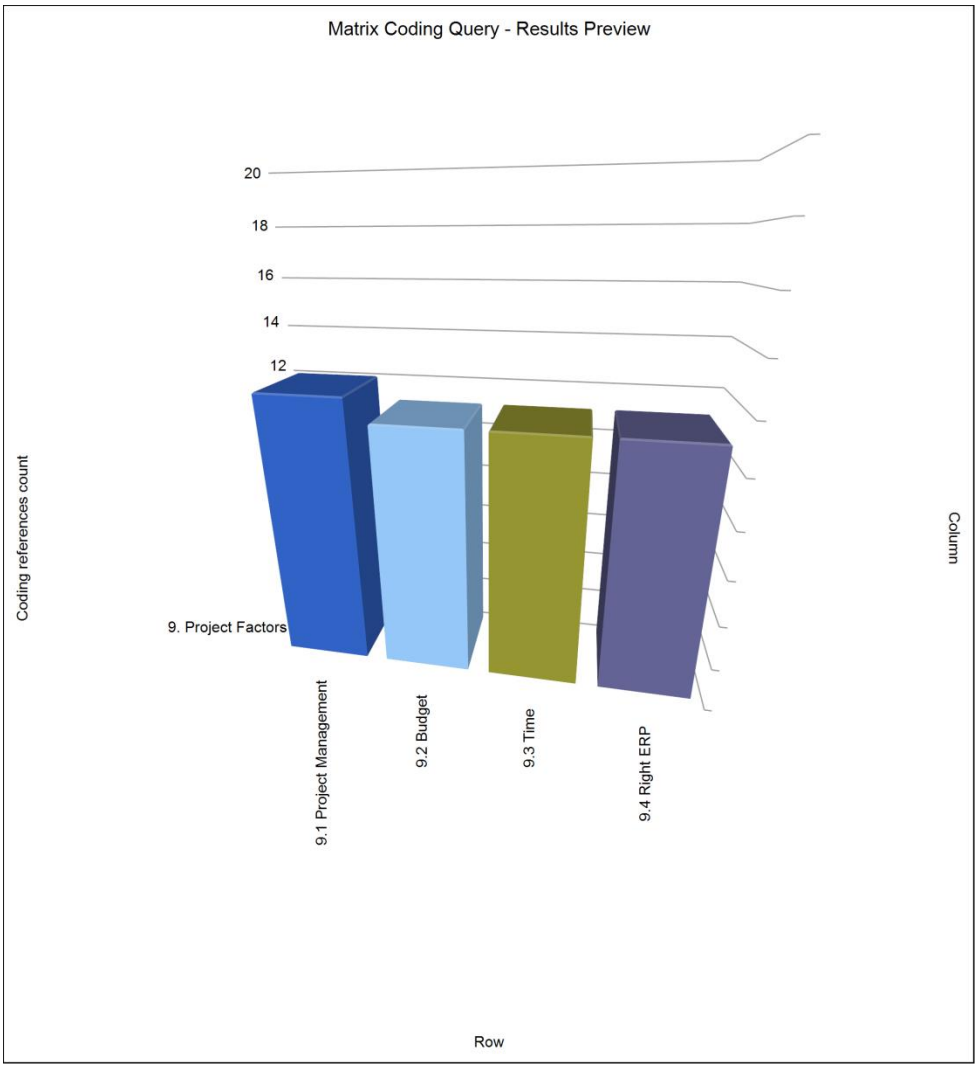

Figure 5. 10 Project factors sub-themes for successful ERP implementation

❖ **Project Management**

All of the participants pointed out that the implementation of the ERP system should be characterized as a project and management of the project is one of the most important tasks of the management and implementers of the project. This was illustrated by TM03,

"Implementation of ERP system in the higher educational institution is a project which requires pre-defined procedures to be followed during the phase of implementation."

Analysis of the responses has also highlighted that proper management of the project needs certain considerations and protocols to be followed. According to TL04,

"The management of the project is expanded from the process of planning to the process of continuous maintenance. Tasks to be performed for management of a project can be named as assessing the availability of resources, maximum utilization of the available resources, making contingency plans, monitoring and evaluation of the project to make the decisions at a higher level."

❖ **Budget**

While implementing any project or introducing any new system for the improvement of performance, financial aspects cannot be ignored. Analysis of the responses showed that the success of the ERP system is associated with the cost of the ERP system to some extent. Any system where the costs of adoptiion are greater than the benefits received cannot be termed successful. According to the views of TL03,

"Cost of the project must not exceed the benefits of the project."

The top management participant TM04 agreed, commenting,

"It is a common perception to compare the cost of a product with its use or benefits, but sometimes the benefits of a project or process cannot be measured immediately because they can be witnessed in long run operations. Hence the finances for the project must justify the benefits and advantages gained at the end of the project."

❖ **Time**

Participants also discussed the importance of time management to make the project successful. According to TL05,

"In my opinion the most important factor of the project which can influence the implementation process of the ERP system is time. Management of time is an art, which should be consulted to make any project successful and effective."

❖ **Right ERP System**

All participants stressed the importance of the selection of a system that is appropriate for the needs of the organisation. An ERP system can be the best system in one context but can be a total failure in another context. The first implementation of ERP for the university was designed for a Bank and was inappropriate for an HEI therefore the system failed badly. Now a new ERP system has been introduced in accordance with the needs and requirements of the educational institution. A participant from the top management stated that,

"It is very important to choose the right and appropriate ERP system. Our institution has witnessed a total failure for its first attempt at ERP system because that ERP system was a Bank ERP system. Users of ERP system and institution as a whole were unable to adopt and adjust with that ERP system."

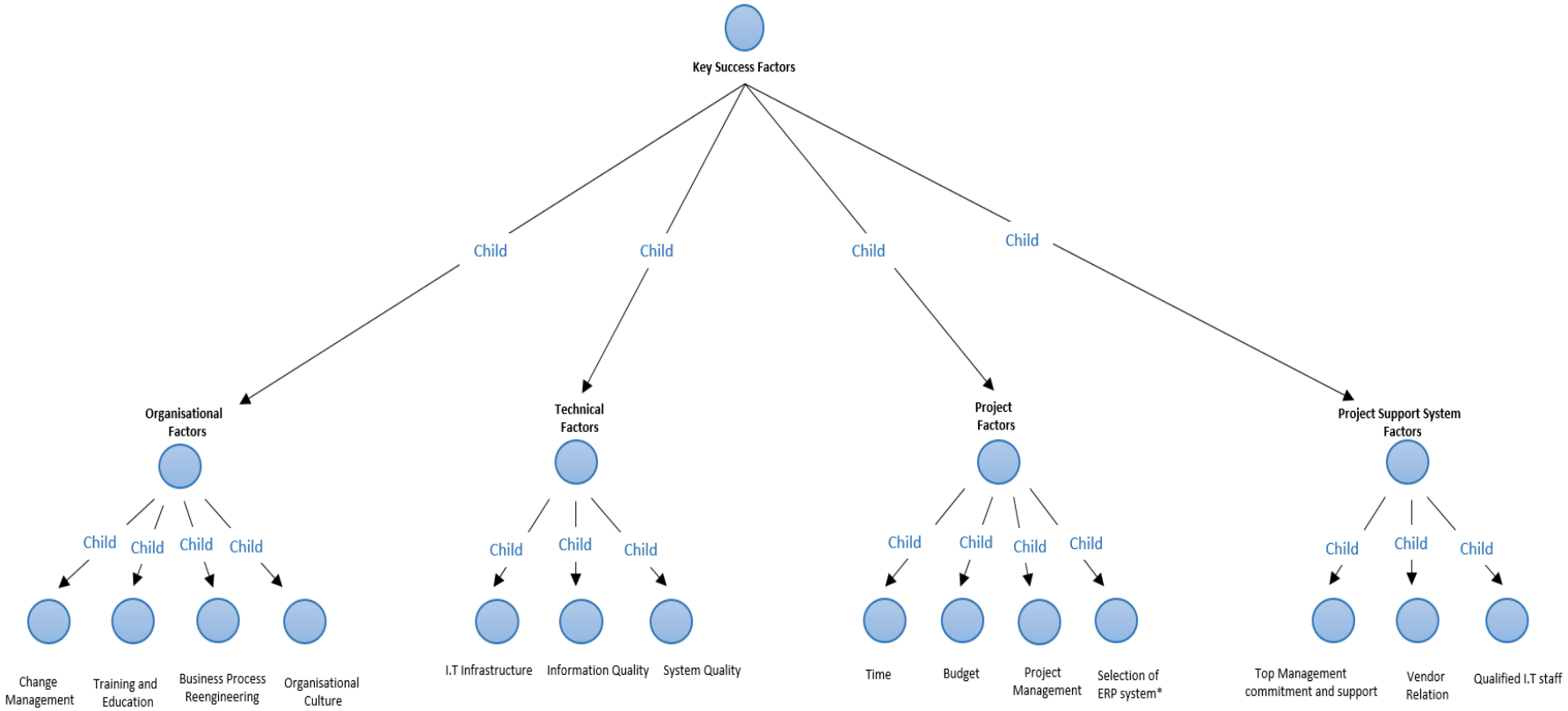

Figure 5. 11 Relationship Map_ Factors Influencing n Successful ERP Implementation

The map extracted from the NVivo 11 software shown in Figure 5.1 above demonstrates the relationship between the themes and sub-themes for the success factors influencing the implementation of the ERP system. Five basic categories were identified during the coding and analysis process through NVivo software and these five categories were subdivided into relevant and specific factors.

5.4 Challenges in Implementation phases of ERP System

This section was designed to identify those challenges which have been faced by the university management while implementing this new ERP system in the institution. Implementation of ERP system can be broadly divided into three phases, namely; pre-implementation phase, implementation phase and post implementation phase. Each phase of the implementation had different challenges and obstacles which were hindering the successful implementation of the ERP system in. These three phases of implementation were coded as themes for this section and the challenges of each phase were the emerging sub-themes. The interview questions were addressed to technical staff as they could provide a better understanding of the challenges due to their personal professional experiences with th implementation of ERP system.

All the themes and emerging sub-themes identified during the coding and analysis are shown in Table 5.3.

Table 5. 3 Themes and sub-themes identified during the coding and analysis

Themes (Parent Nodes)	Sub-Themes (Child Nodes)
Pre-Implementation Phase	• Top Management Commitment • Integration • Compatibility • Cost of ERP System
Implementation Phase	• Data Migration • Reengineering Business Process • ERP System Goals Ambiguity
Post Implementation Phase	• Resistance by Users • Lack of Adaptation • Non-Utilization of ERP Functions • Measurement Plans at University Level

5.4.1 Pre-Implementation Phase

The Pre-implementation phase can also be named as the planning phase for a project. Respondents emphasized that the pre-implementation phase was the most important phase for assessing the feasibility of the project. Some of the important challenges which were identified by the participants for this phase are presented in NVivo input in Figure 5.12.

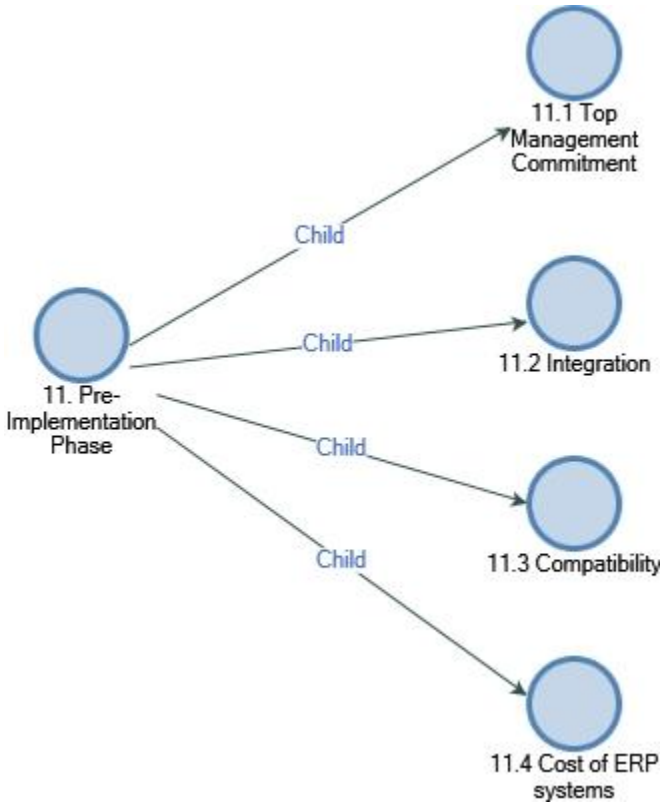

Figure 5. 12 KSFs in the Pre-implementation phase

❖ **Top Management Commitment**

During the pre-implementation phase the commitment, support, understanding, and interest of top management can help in designing and exploring the best available options for the success of projects. But according to the views of participants, there was a lack of interest and commitment from top management which was a challenge for the technical staff and especially for those who were assigned the responsibilities for planning the implementation. As per the words of TL01,

“The top management will play a critical role in this pre-implementation phase that would be a determining factor in the relationships build on the ground for the implementation process.”

❖ **Integration**

In order to implement the ERP system in the educational institution, all the functions, and operations of the organisation need to be integrated in such a manner that accessibility and validity of the data should not be compromised. Participants were of the view that this process of integration was difficult because of the lack of understanding of the system by users and the lack of expertise in the skills of integration. According to TL03,

"One of the challenges at the phase of pre-implementation can be ERP implementation. This process of integration can be difficult to understand without the prior training and knowledge."

❖ **Compatibility**

Respondents were of the view that the IT infrastructure comprised of many different systems that were not integrated. Before this new ERP system, the bank ERP system was implemented which had the issues of compatibility and relevance. The technical level participants highlighted the need for a compatible and appropriate ERP system, and this compatibility of should be investigated at the pre-implementation phase. According to TL 03,

"There were issues of unified IT infrastructure an integration of multi-systems. However, HEI_I systems were based on Mean Frame with multiple applications but these systems are not talking to each other. Also, the earlier legacy systems were not compatible with the organization's targeted objectives. Thus, efforts were required to make the system compatible."

❖ **Cost of ERP**

The implementation of ERP system was considered as a running expense, but in fact, it should have been considered as an investment which can bring benefits in the long run. Respondents pointed out the issue of cost management. They were of the view that the quality of the ERP systems was being compromised due to low-cost quotations given by the vendors. As per the views of TL 04 and TL 05,

"ERP implementation is not a cost, it's an investment. Most educational institutions fail to recognize that ERP implementation is an investment that will yield profit in the long run. In turn,

they look out for the vendors who offer them the lowest quotes thus overlooking the expected benefits and results."

5.4.2 Implementation Phase

After the planning and feasibility phase, the next step in the implementation of the ERP system is actual implementation. The departments that are included in the ERP implementation phase are Human Resources, Finance, Information Technology, Logistics, and Maintenance. All the modules of the ERP system were implemented in all the departments of the organisation at the same time. During the implementation phase, the challenges of Data Migration, Re-engineering of the business processes, transition from old to new systems, and the ERP system goal were highlighted by the participants. The theme and sub-themes are shown in Figure 5.13.

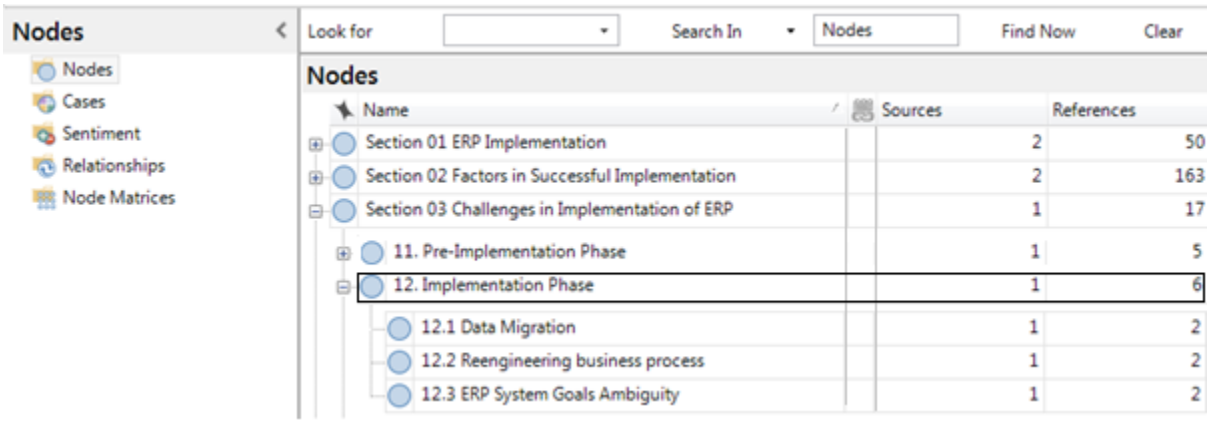

Figure 5. 13 Implementation phase

❖ **Data Migration**

The transferring of data from old legacy systems into a new ERP system is term as data migration. This process requires a high level of accuracy and expertise. Successful implementation of ERP depends upon the incisiveness of data migration.

According to the responses of respondents, data migration is the key step towards the achievement of overall system functionality. Data migration for this institution was performed by the new vendor. A number of specialized activities were conducted to convert the related data from old legacy applications to designated modules of the new ERP system. As the technical participant TL01 commented,

"It is important to note that data migration consists of:-

- *Converting the extracted data appropriately from legal applications to conform to MSD system.*
- *Data cleaning and refining for the extracted data*
- *Provision of an outline detailing tasks to be undertaken by the vendor."*

❖ **Re-Engineering Business Processes**

In order to replace the old legacy systems with a new ERP system, the business processes of the organization needed re-engineering and rescheduling. This was confirmed by the responses of the interviews which showed that the processes of the organisation should also be compatible with the demands and requirements of the new ERP system. The re-engineering of business processes turned out to be a challenge for the management of HEI. In the words of TL03,

"HEI_I simply underestimated the extent to which they have to change and re-engineer the existing business processes to accommodate their purchase of new ERP system."

❖ **ERP Systems Goal Ambiguity**

Technical staff complained that the objectives of the ERP system implementation were not clearly communicated to the staff members. When top management set the basic goals and objectives for the ERP system, no consideration was given to the input and ideas from the users of the system. According to TL03 and TL05,

"No clear objectives and goals were set at the time of planning for ERP implementation; this ambiguity hindered the successful implementation of ERP system in HEI_I."

5.4.3 Post Implementation Phase

The success of the ERP system depends upon the continuous maintenance and technical support provided after the completion of the implementation phase in an HEI. There were some challenges which were faced by the management at the stage of post implementation. Most of the challenges after implementation were related to the users, because, they were the

stakeholders whose satisfaction matters the most in the evaluation of the system. Sub-themes under this stage are shown in figure 5.14.

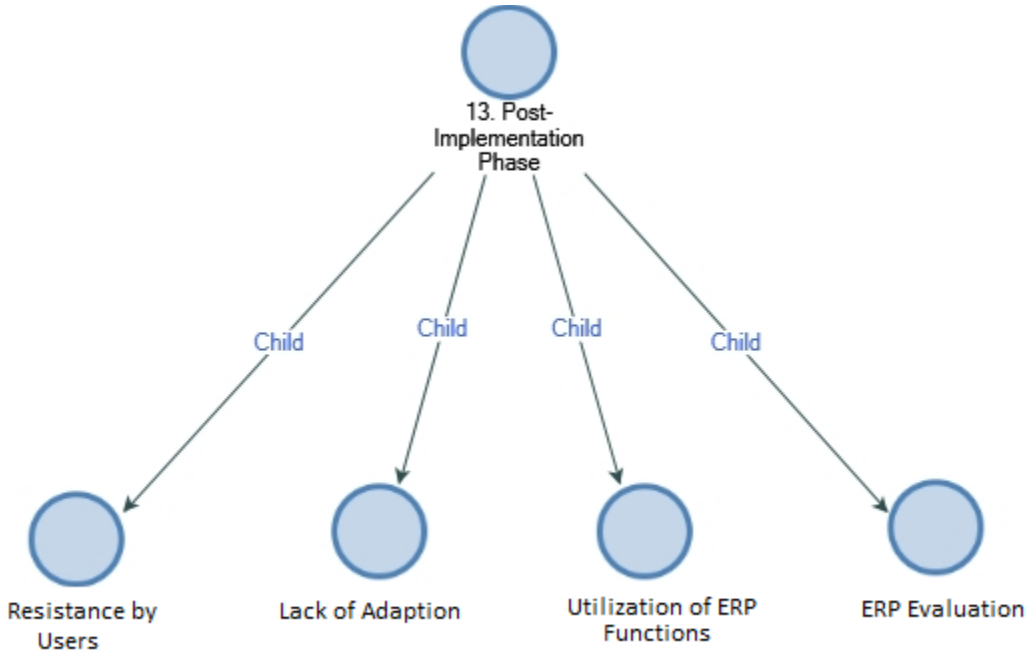

Figure 5. 14 Post Implementation phase

❖ **Resistance by Users**

Resistance from the users of the system was a concern for top management. Responses showed that majority of the users were reluctant to use the new ERP system. Some of the reasons for their resistance were the lack of willingness to adopt the new system, lack of education, lack of training, and difficulty in using the new system. As per the words of TL03,

"Internal resistance from the employees of the organisation can lead to the disruption in the successful implementation of the ERP system at post implementation phase."

❖ **Lack of Adaptation**

One of the basic reasons behind the poor utilisation and resistance to the use of the new system was the non-willingness of employees in the adapting to the organisational changes required for the new system. This unwillingness has affected the motivation and interest to learn about the new ERP system. According to TL03,

"Lack of adaptation to the new system and non-motivation to compete was a challenge in making ERP system successful."

❖ **Non-Utilization of ERP Functions**

There were hundreds of integrated functions and operations which can be performed by the maximum utilization of an ERP system within an HEI but it was observed in the analysis of responses that most of the features and functions of ERP system were either used a little or not used at all. This non-utilization resulted in less than the desired performance and affected the results of the ERP system. As stressed by TL03,

"Non-utilization of all the available functions of ERP system leads to the non-achievement of targeted objectives and goals."

❖ **ERP Evaluation**

Evaluation of any project is needed to identify any shortcomings or discrepancies in the implementation of the project. The ERP system was implemented in all the departments of the HEI at the same time, therefore, the measurement of the successful implementation was needed to be carried out at both the department and top management level to compare the outcomes of the ERP system with the desired objectives. This measurement plan was lacking at the university level as highlighted by TL01 in these words,

"It is noted that no measurement plan is available at the university level, but there are plans that are documented down the hierarchy where ERP system has been implemented. The plans provide an explanation and definition of all the services provided as ERP where the outcomes can help measure organizational performance."

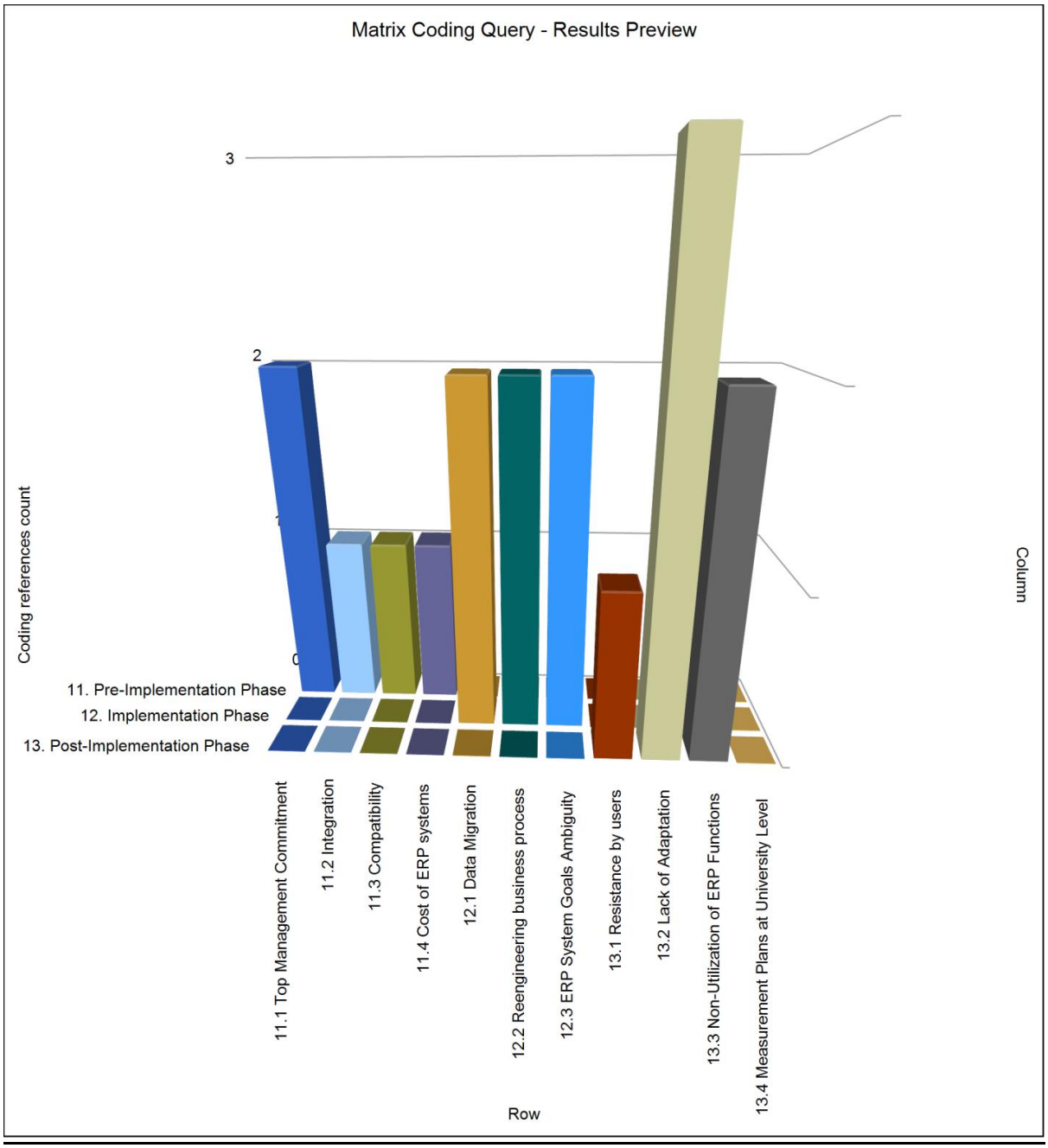

Figure 5. 15 the matrix coding query from NVivo 11 software

The matrix coding query from NVivo 11 software has supported the content analysis for the constructs or sections of the challenges in the implementation of the ERP system. These challenges were identified for each phase of the implementation and these phases are represented on the base of the chart. Different sub-themes emerged for these three phases. The sub-themes are represented in different colour contrasts for better understanding and visual

presentation. The challenge that has been most highlighted by the analysis of the responses though NVivo 11 was the lack of adaptation and this challenge was faced by the management at the post implementation phase.

5.5 Issues in Use of ERP system

As it has been discussed earlier there were some challenges while implementing the ERP system and some issues were also observed by the users. The construct or section identified was for the issues faced by most of the staff members. Some of the issues were at the organizational level, some were of a personal nature and some were related to the technical difficulties. The important sub-themes that emerged during the coding and analysis of the interview responses are presented in table 5.5.

Table 5. 4 Themes and sub-themes identified during the process of coding and analysis

Themes	Sub-Themes
Problems in Using ERP	• Compatibility • Resistance to change • System integration • Lack of training & education • Poor Communication
Maintaining ERP	• Expenses • IT support • Evaluation • Right system & Right Vendor
Transfer of information from old information system to New ERP	• External vendors • Difficulties

5.5.1 Problems in Using ERP

Some organizational and personal factors emerged from the responses of participants. These factors affected the successful implementation of the ERP system by creating difficulties, hurdles or hindrances in the use of the system. The important sub-themes are presented in figure 5.16.

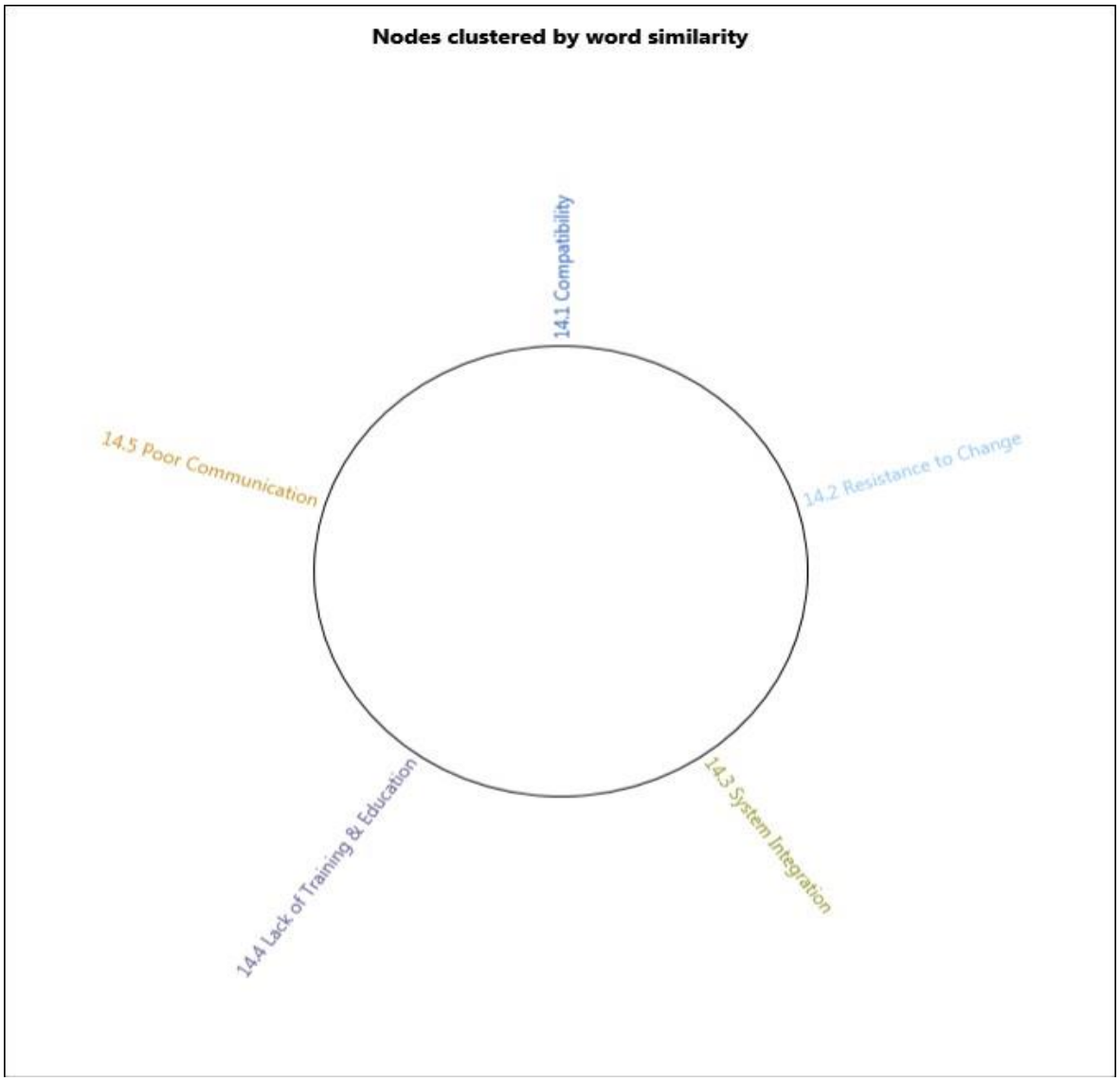

Figure 5. 16 Sub-themes observed as problems in using of ERP system

- **Analysis of Sub Themes of Problems in Using ERP System**

The responses from the participants identified the sub-themes of compatibility, resistance to change, system integration, lack of training and education and poor communication. These sub-themes were analysed through the NVivo 11 software. The matrix coding query chart has presented the relationship between the themes and its sub-themes.

The results of the interviews showed that the most important and most pinpointed problem in using the ERP system was resistance to change which was 32-33% of the overall responses of the

participants. The sub-themes are presented in different colours and are presented in the chart below. In the views of TL 01 and TL 02,

"The staff of the HEI_I is not ready to use the ERP system implemented in the institution"

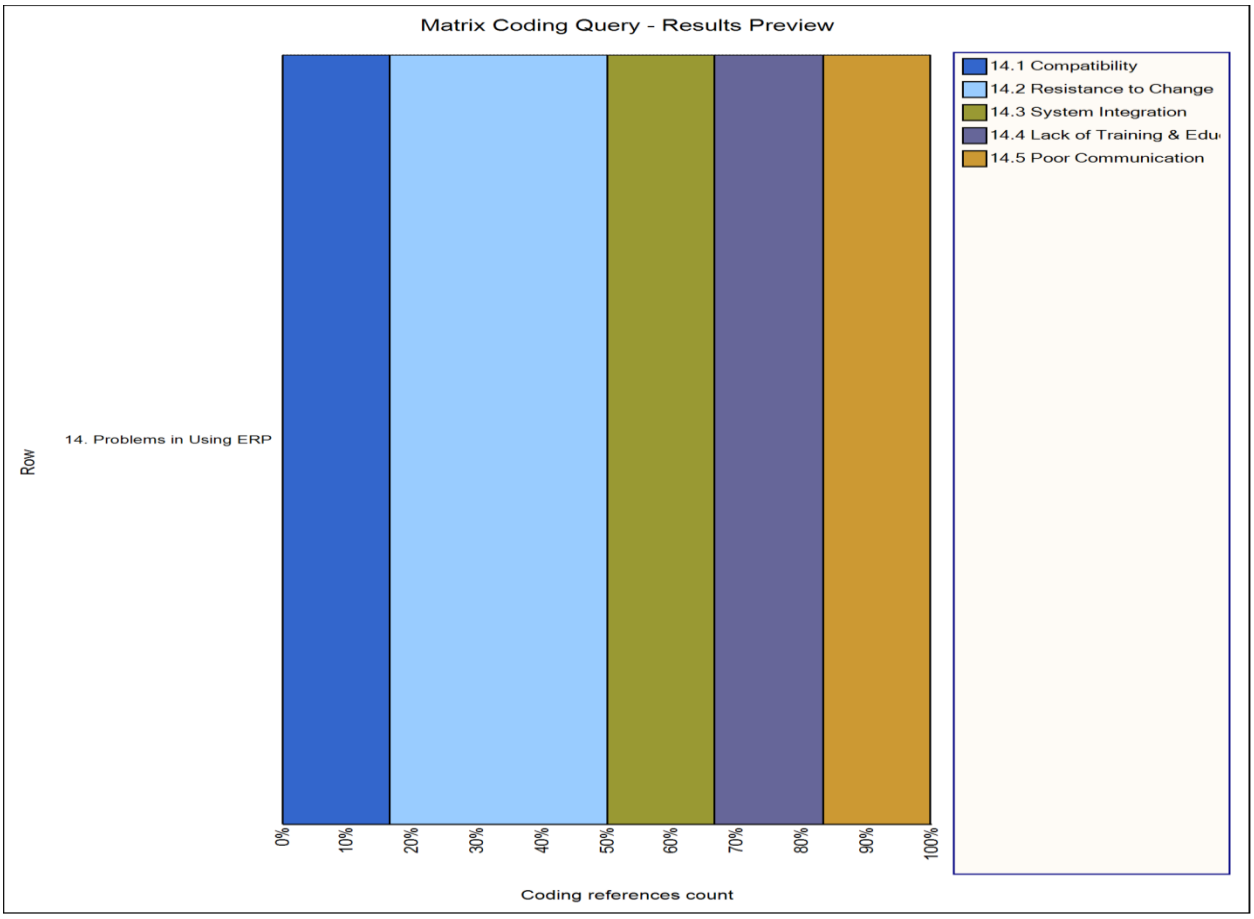

Figure 5. 17 Matrix coding query chart analysed through the NVivo 11 software

5.5.2 Maintaining ERP

Any computer aided system requires continuous maintenance for its effective usage. This maintenance of the ERP system is not always an easy task to perform and there are a number of factors involved. These important factors re be classified as the sub-themes for the basic theme of maintenance of ERP system. These sub-themes are presented in NVivo as shown in Figure 5.18.

Figure 5. 18 Maintaining ERP presentation of sub-themes in NVivo

❖ **Expenses**

The implementation of an ERP system is a recurrent cost process due to the continuous nature of maintenance and administration. This issue of running expenses is important because it can impact the decisions made by the management on the cost effectiveness of the ERP system. As per the words of TL 01,

"One of the important internal challenges in maintaining the ERP system is the recurring cost of maintenance and an operation as it is very expensive."

❖ **I.T support**

In order to maintain the ERP system and achieve the best possible results, support is required on a daily basis from the technical staff of the IT department. The technical staff need to be well qualified and trained to render the required support and maintenance of the system. The analysis of the responses indicated that there was a lack of trained technical staff to provide the support and maintenance required. According to TL 03,

"We are facing the problem of a lack of trained staff in our university to support the regular maintenance of the ERP system."

❖ **Evaluation**

After the post implementation phase, the ERP system needs a strong and unbiased evaluation and assessment process to compare the achieved outcomes with the predefined goals and objectives of the organisation. One of the problems in maintaining the ERP system was consistency and transparency of this evaluation process. Evaluation is important to determination the ongoing changes required.

The issue of the evaluation was pointed out by the technical staff participant TL 02,

"The ERP system must be continuously evaluated and upgraded to meet the ever-changing needs of the organisation."

❖ **Right System and Right Vendor**

Most of the respondents were of the opinion that the new ERP system was potentially a good fit in the HEI, in contrast to the previous system which was a total misfit. Therefore the selection of the right system is a challenge for successful implementation. In addition to the one-time purchase, a regular productive relationship with the vendor of the ERP system was essential for the maintenance of the ERP system. According to the views of TL 04 and TL05,

"There should be a meeting of minds between technical staff of HEI_I and ERP software vendor. This process will lead to a formidable partnership. A positive relationship between an ERP vendor and the customer is when both meet each other's needs. As such, working with the right vendor and software eliminates any risks of dealing with a wrong ERP software."

5.5.3 Transfer of Information from Old information system to New ERP system

In order to adopt an ERP system in an organisation, the issue that arises is the transfer of the information/data from the old information system to the new ERP system. This issue can create many problems for the effective use of ERP system and getting the best from its features. Sub-themes for this issue are shown in figure 5.19.

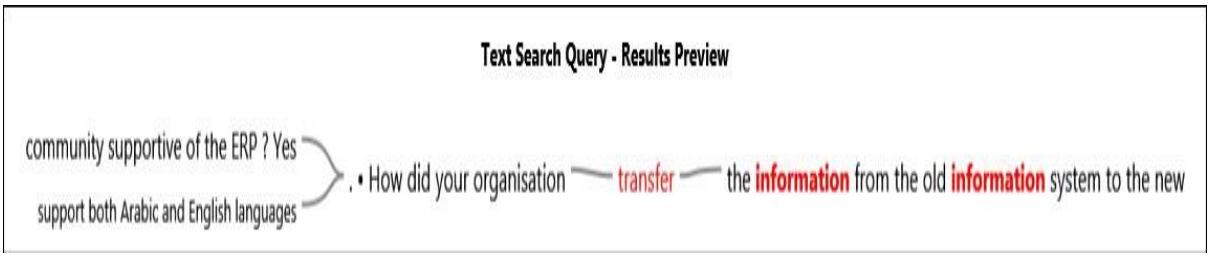

Figure 5. 19 Transfer of Information from old information system to new ERP system Sub-themes

❖ **External Vendor**

The technical staff were asked to provide the answer to how this transfer was completed. All of the respondents identified this as the responsibility of the external vendor who had supplied the new ERP system and had some difficulties carrying this out. According to TL 03,

"The HEI_I transferred the information from old information system to new ERP system through the external vendors."

❖ **Difficulties**

Another of the problems with data transfer was the structure of the data in the old legacy system. Participants also highlighted the lack of understanding for the cross functional business processes and the underestimation of the re-engineering required. As stated by TL 01,

"The organisation suffered for a long time due to bad data structures of legacy systems and less understanding of cross-functional business processes is also reported sometimes"

5.6 Evaluation of ERP System Performance

This section of the analysis was specifically designed to evaluate the ERP system. For the purpose of evaluation of any system or project, a means of measuring the outcomes of the project and comparing these outcomes with the predefined objectives is needed. Themes related to the process of evaluation emerged during the coding process for the responses from the interviews. These themes identified the methods used for the measurement of the results and performance of the system. Responses also indicated that there was room for improvement and suggestions for enhancements to the system were made by the participants. Themes and sub-themes identified are shown in table 5.5 below:

Table 5. 5 Evaluation themes and sub-themes

Themes	Sub-Themes
Instruments/Methods for measuring ERP outcomes	• IT Staff evaluation • User satisfaction • Improvement in business performance

	• Achievement of Goals
Stakeholders	• Definition • Stakeholder's Satisfaction
ERP Performance Evaluation	• Success • Failure • In-Between
Productivity	• Effect of ERP productivity • Deficiency
Improvement in ERP system & Future expectations	• Students participation • Training of students • User friendliness • Integration • In-House Maintenance

5.6.1 Instruments/Methods for measuring ERP outcomes

Questions were included in the interviews to identify appropriate tools for measuring the outcomes of ERP systems. Participants were asked whether the university used particular methods for this purpose. Responses revealed that the measurement of the ERP outcomes depended upon user satisfaction, business performance, targeted goals, and evaluations by the IT staff. These sub-themes are presented through NVivo output in Figure 5.20.

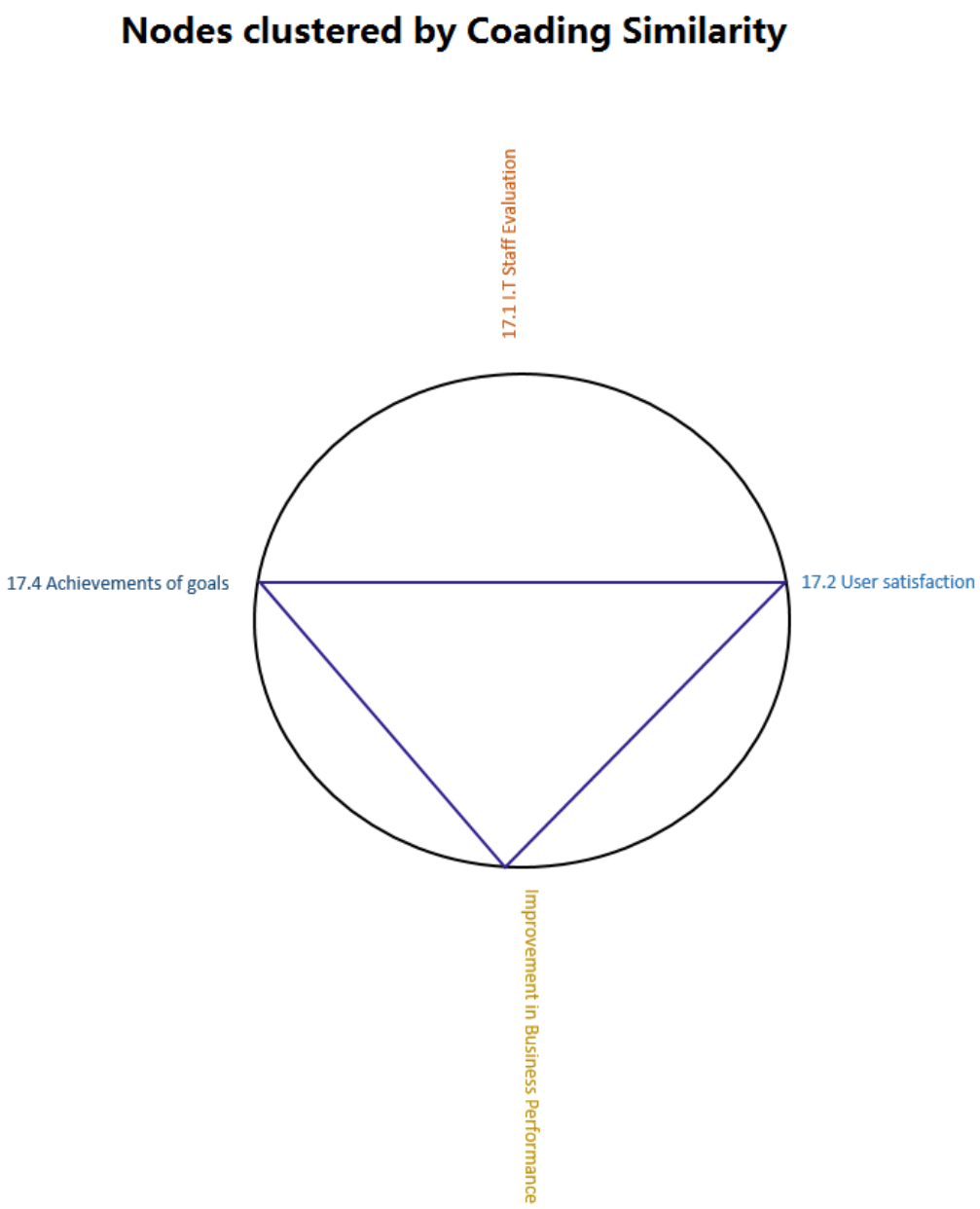

Figure 5. 20 Measuring ERP performance sub-themes

❖ **I.T Staff Evaluation**

The IT department is the prime user of the ERP system. Therefore the IT staff of the university are the best qualified for the evaluation. Their opinions for improvements to the system should also be considered. The responses from IT staff regarding the effectiveness of the system can be considered as a tool to measure the ERP outcomes. As stated by a member of the IT staff TL01,

"The evaluations by the IT staff were the measure of the success or failure of ERP system. Earlier the IT staff estimated the losses from the previous ERP system (i.e. Bank ERP) but the top management were not supportive of their evaluation."

❖ **User Satisfaction**

The staff from the IT department, Procurement, Logistics, Finance, and HR were the main users of the ERP systems. Successful implementation of the ERP system can be measured through the satisfaction of these users. If the users are satisfied they will promote the maximum use of ERP system operations in other departments. User satisfaction was a measure for evaluating the outcomes of the old ERP system. Participant TL03 emphasized,

"The satisfaction of end users can decide the success or failure of the implemented ERP system."

❖ **Improvement in Business Performance**

The basic purpose for the implementation of the ERP system was to bring improvement in the performance and productivity of the business. This predefined objective for the project can also serve as a measure of the ERP outcomes and to assess the success of the ERP implementation. According to TM 01 and TM 02,

"One of the existing instruments used in HEI_I for the measurement of ERP outcomes is the assessment of the intended improvements in business performance."

❖ **Achievement of Goals**

Analysis has indicated top management set the goals and objectives of the ERP system, so they can also be used for evaluating the success of ERP implementation. As stated by TL 02,

"The predetermined organizational goals set by the top management were used earlier to measure the ERP implementation results and these can be used for the new ERP system."

5.6.2 Stakeholders Assessment

While evaluating the success of ERP system, one important theme to be discussed was the main stakeholders for the ERP system and the satisfaction gained from the ERP system by these

stakeholders. The emerging sub-themes under the theme of stakeholders are shown in Figure 5.21.

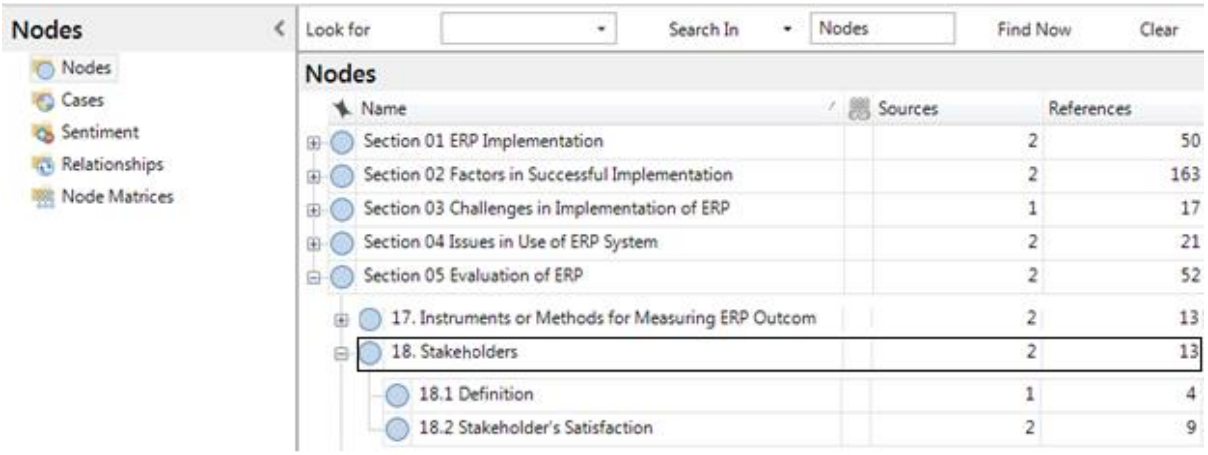

Figure 5. 21 Sub-themes under the stakeholders

❖ **Definition**

The technical staff participants were questioned regarding their perception regarding the meaning of stakeholders in the HEI. Responses revealed the staff of the university as the stakeholders for the evaluation of ERP implementation. It was found that satisfaction of stakeholders was considered to be one of the main criteria for measuring success or failure of the ERP implementation. As per the words of TL 02,

"The technical staff or the IT staff of the university are the stakeholders for the measurement of ERP implementation."

❖ **Stakeholder's Satisfaction**

Views and opinions were gathered from the participants regarding the suitability of stakeholder satisfaction as a measure of the success of the ERP implementation in the HEI. Most of the participants supported the use of stakeholder satisfaction as a measure. Some of the participants were of the view that a combination of top management satisfaction and staff member satisfaction should be adopted, because it has been witnessed that the evaluation based on the satisfaction of technical staff is not always appropriate. According to TL 03,

"If the stakeholders are not trained well to use the ERP system then it would not be suitable to use their satisfaction level as a measurement instrument because they will not decide properly."

Figure 5. 22 Stakeholder's measurement word Frequency Test

5.6.3 ERP Performance Evaluation

Participants were questioned to evaluate the success or failure of the ERP system according to their knowledge and practical experience. All participants which included top management and technical staff participated in the evaluation process. Sub-themes under the evaluation of ERP system are shown in Figure 5.23.

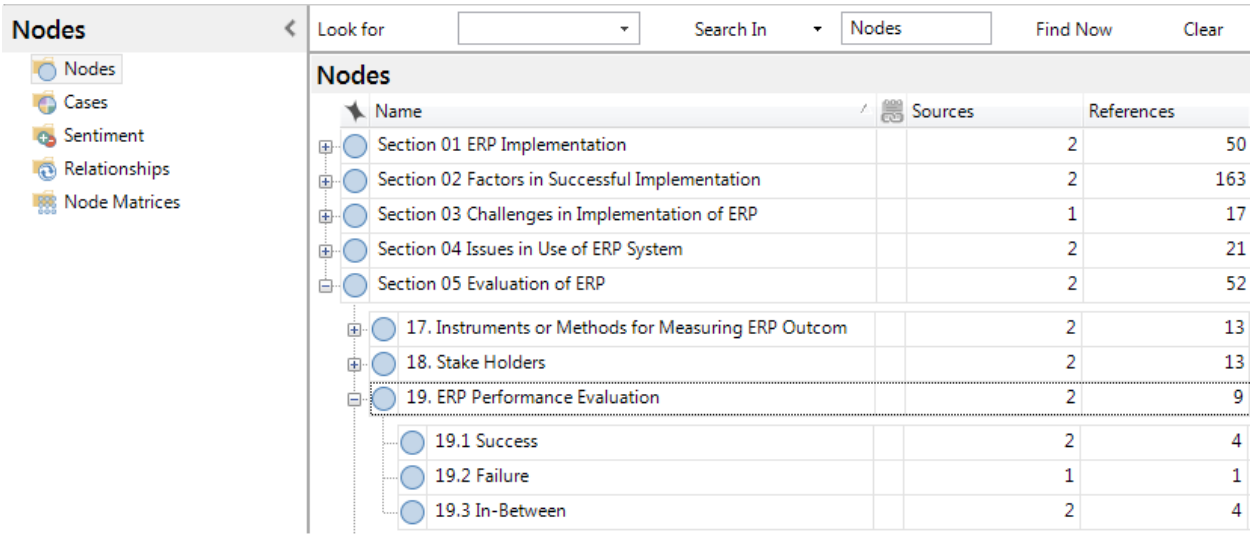

Figure 5. 23 Sub-themes under the evaluation of ERP system

For the theme of ERP performance evaluation, three sub-themes emerged through the responses of the participants wich were success, failure, and in-between performance of the ERP system. Responses of top management and technical level management were analysed separately for the evaluation of ERP system. The NVivo 11 representation of analysis showed an interesting finding that according to the respondents of top management, the new ERP system was showing good signs which should result in its success in future. Whereas, according to the technical staff, the new ERP system was more likely to fail. This can be seen in Figures 5.24 and 5.25 below:

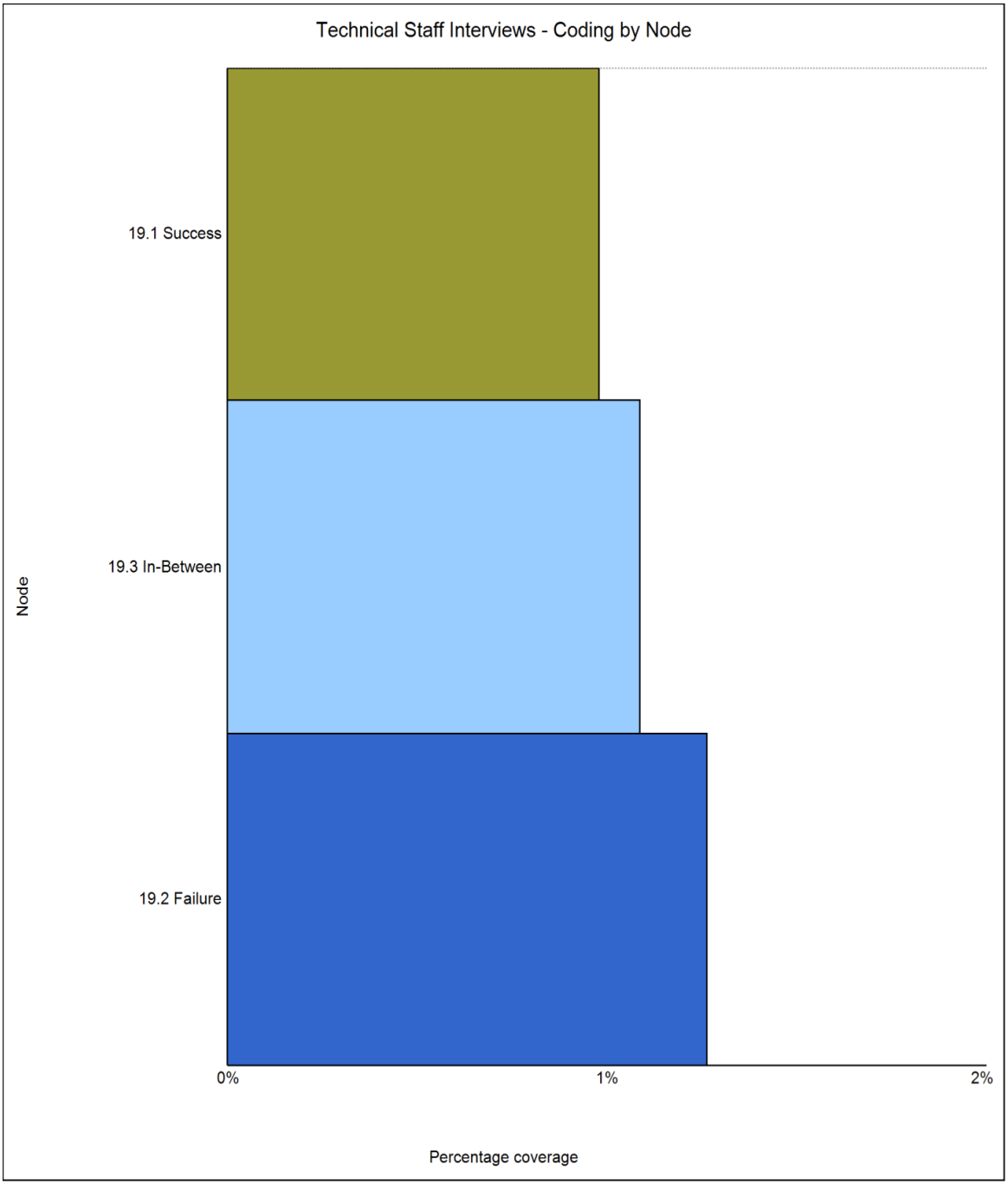

Figure 5. 24 Evaluation from technical level staff of HEI_I ERP system

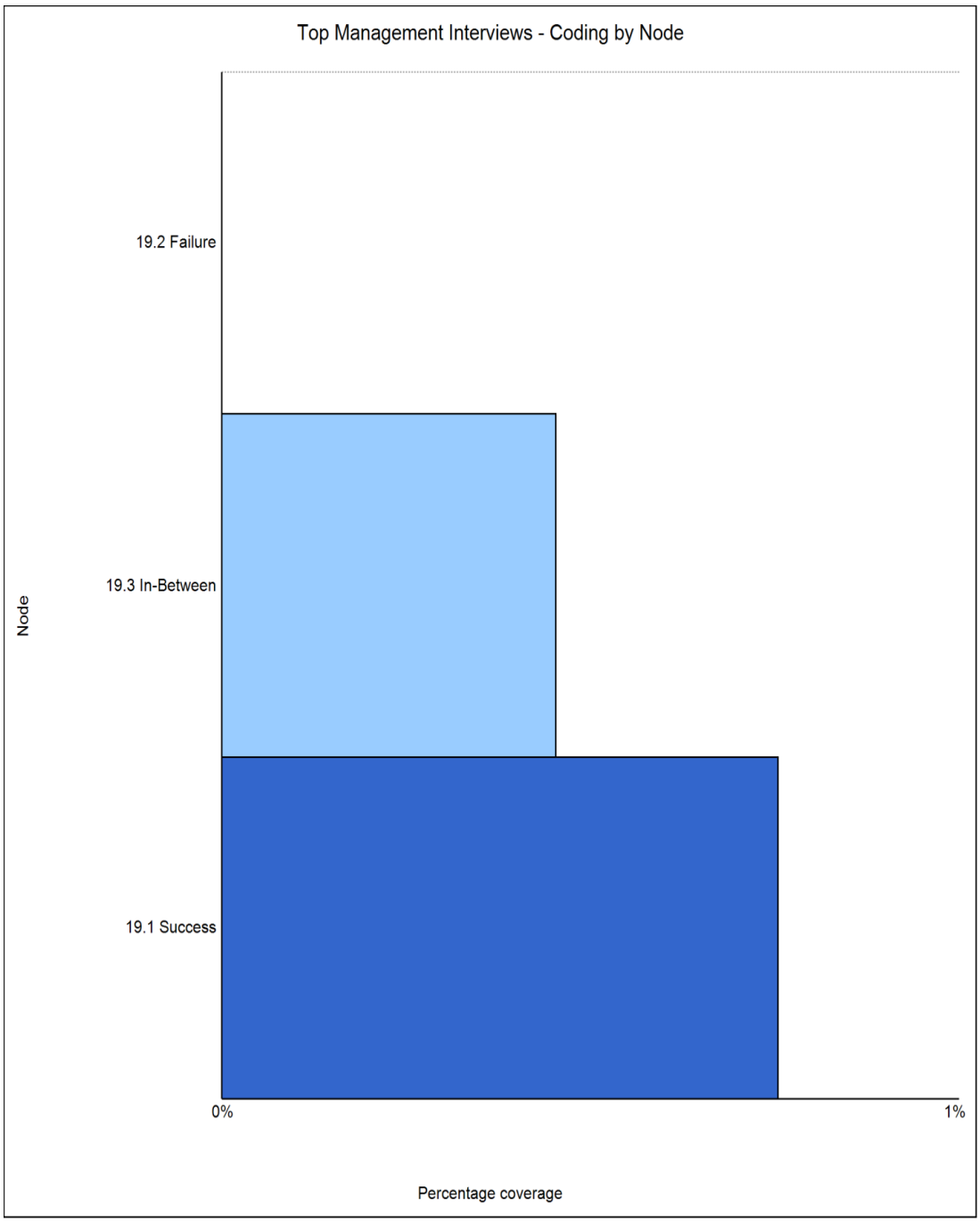

Figure 5. 25 Evaluation from top management level staff of HEI_I ERP system

5.6.4 Effectiveness and Efficiency of the organisational process

One of the basic objectives of the implementation of the ERP system in the HEI was the improvement of productivity. Success or failure of ERP implementation can be measured by

whether or not this objective is achieved. Sub-themes for the measurement of productivity are shown in Figure 5.26.

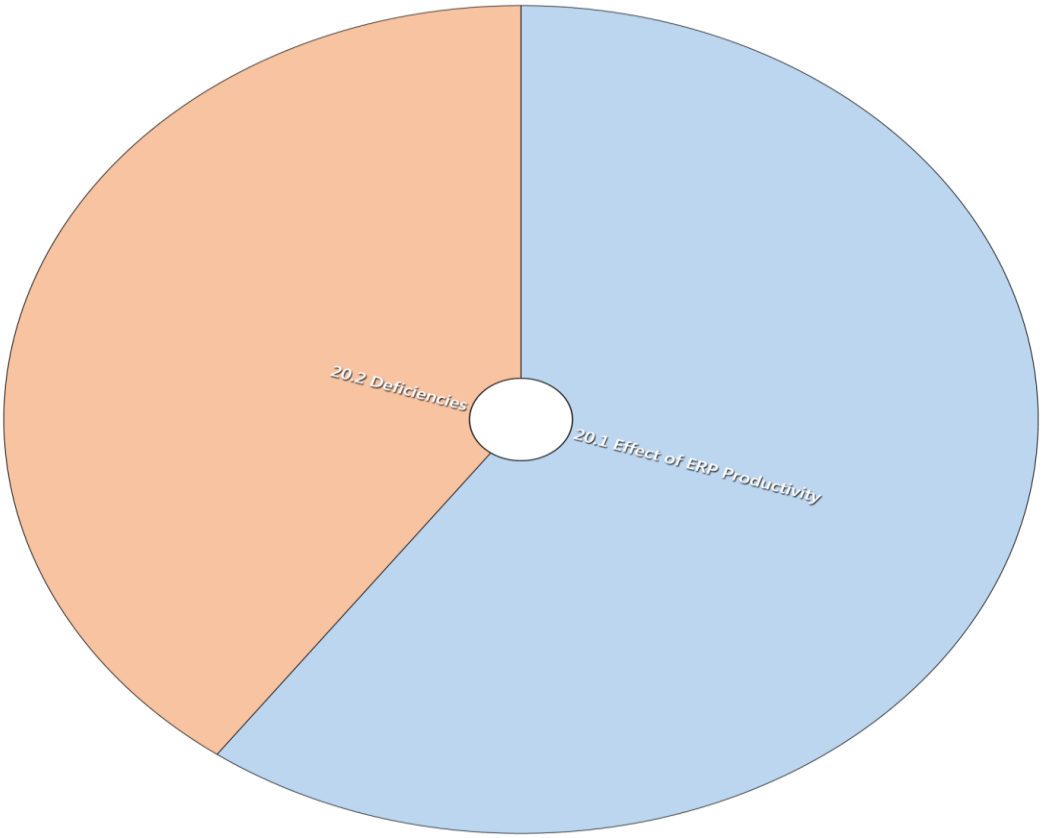

Figure 5. 26 Sub-themes for Measurement of Productivity

❖ **Effect of ERP on Productivity**

Responses provided by the participants revealed a lack of significant enhancement in the productivity of the organisation. The integration of the existing systems into one ERP system should increase productivity. There are specific reasons for companies to make investments in technology but typically cost reduction and productivity enhancements are the most important aspects in this regard. As per the words of TM 04,

"When major business processes are automated, the business productivity software provides the platform where the communication of goals and objective flourishes across the operational activities enables time efficiency, hence, fostering and utilizing some time on other priorities."

TM 06 highlighted another aspect of organizational productivity with reference to ERP system by stating that,

“Adopting and implementing such ERP systems gives assurance of improving an organization’s efficiency and performance. The integration of the services and functions in higher education involves the incorporation of the functions of human resource and finance departments that are usually hinged upon discordant information packages.”

❖ **Deficiencies**

The respondents gave their suggestions regarding the missing elements in the existing ERP system which are creating a hindrance in the achievement the goal of increased productivity. These missing elements can be summarised as database integration, web applications and accessibility of ERP system by every employee of the organisation. As per the words of TM 01 and TM 02,

"The missing part of the ERP system which can increase the productivity of the organisation is connectivity of web applications with the ERP system as the ERP system is a desktop application.”

According to TM 06,

“A database shared across different departments for diverse functions and business modules entails the avenue that supports increased organizational productivity through the adopted ERP system.”

A participant from the top management (TM 03) highlighted that,

"A complete improvement in productivity comes when each employee in the university will have the access to the ERP system.

5.6.5 Improvements in ERP System and Future Expectations

While evaluating the success of the ERP system, participants from top management identified some suggestions and recommendations for the improvement of the ERP system in future. Basically, these suggestions are the missing links which are supposed to be incorporated in the ERP system to make it more effective and more productive to achieve the overall growth, development, and performance of the HEI.

Figure 5.27 shows the sub-themes emerging from this theme.

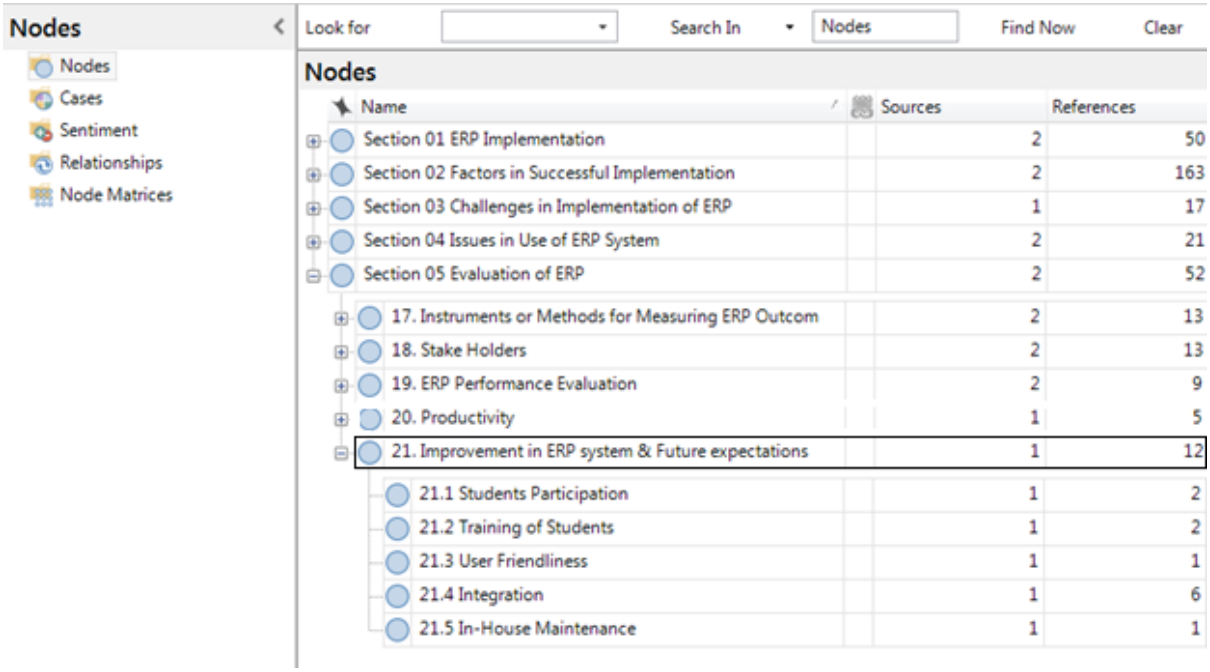

Figure 5. 27 Sub-themes regarding the improvement and future expectation in ERP system

❖ **Student's Participation**

The ERP system was implemented in the HEI to improve the performance of the institution and this performance depends upon the satisfaction of students. Analysis of the responses identified that student participation is required to improve and enhance the performance of the ERP system. As per the words of TM 03,

"In order to improve the ERP system, there is a need to make students part of the ERP system implementation."

❖ **Training of Students**

If participation in the ERP system implementation is required then there will be a need for training of the students to equip them with the basic knowledge and skills for the use of ERP system. This will help the HEIs produce graduates fit for the employment market. According to TM 03,

"*The educational organisation would like to see the future ERP system training the students of institutions in the use of the ERP system and making them ready for the practical market after their graduation or certifications"*

❖ **User Friendliness**

Some of the participants were of the view that the ERP system needs to have a more user-friendly Graphical User Interface (GUI) because the present ERP system is difficult to use and very technical. Moreover, the speed of the ERP system must also be enhanced to obtain a better outcome in terms of usage and performance. According to TM 04,

"The ERP system can be improved by designing and making easier to use applications"

❖ **Integration**

The basic purpose of any ERP system is to integrate the departmental data into a single database from where the data can be retrieved and achieved easily for time-to-time usage. Therefore the feature of integration is considered as the most important characteristic of an ERP system. Most of the participants stressed the need for the improvement in the integration of the system. As per TM 04,

"The organisation would prefer to see connectivity of registration system with the ERP system and automation of all other business tasks with the ERP."

Importance of integration process was also emphasized by other participants from top management like TM 01 and TM 02,

"ERP system can be improved by improving data archiving and integration and by making web based ERPs."

❖ **In-House Maintenance**

The ERP system needs continuous maintenance and technical support for the smooth running of its functions and the cost of this maintenance can affect the successful implementation and performance of the ERP system. Therefore, one of the respondents was of the view that there is

a need to reduce or minimize the running expenses of the ERP system. As per the words of TM 05,

"ERP system can be improved through In House maintenance in future to reduce the maintenance and running expenses incurred on the ERP system."

Figure 5.28 present relationship map for improvement ERP system & future expectation.

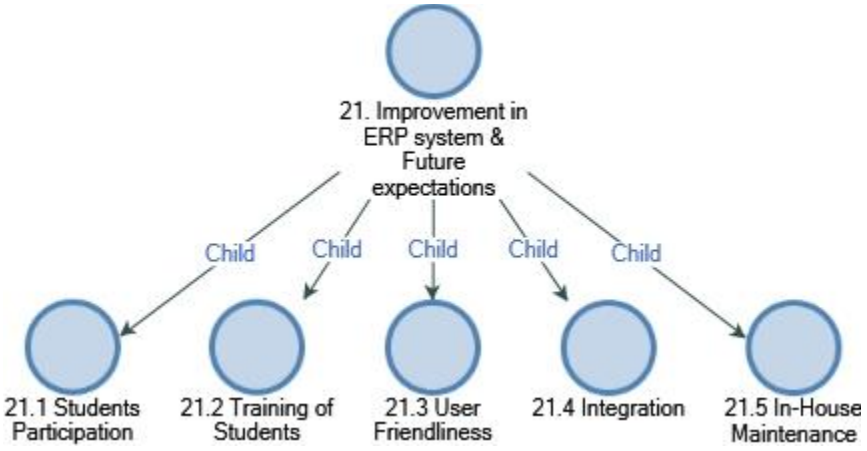

Figure 5. 28 Relationship map for improvement ERP system & future expectation

5.7 Chapter Summary

By summarizing the findings of case study one, it can be concluded that the ERP implementation was not successful, even in its second attempt. It has been mentioned earlier that the existing ERP system was a replacement for the earlier bank ERP system. The HEI studied in case study one was a private university, in which a bank had shares. This situation influenced the selection of the right ERP system, and resulted in the adoption of the bank ERP. According to the dominant views of the case study participants, bank ERP was not suitable for the academic institution therefore its implementation was a total failure. After the failed attempt, the university had implemented the Microsoft Dynamics ERP system, which was in the post implementation phase. In order to implement the system, a Big Bang approach was used in which all the modules of the system were implemented in all the departments of the institution at the same time.

The existing ERP system in case study one has issues of acceptance and compatibility which resulted in resistance to the adoption by users. The management of the institution has adopted strategies like the provision of incentives for the promotion of training and use of the ERP system, educating the users to eliminate the difficulties in understanding and compatibility, but still the issue is causing problems. Management are avoiding the issue, giving it little attention having decided that users will accept the new system with the passage of time due to their pressing needs.

While evaluating the performance and success of the ERP implementation, an interesting fact was observed. Top management considered the system would eventually be successful but the technical staff disagreed and though that failure was more likely. Level implementation of ERP system is moving towards the failure. This variation in the views of two levels of participants from a same institution indicated that there was a need for inclusion of another instrument for evaluation which is assessment at different hierarchical levels by individuals. The most influential success factor for this case study 1 was “Selection of the right ERP System”.

Some suggestions made by the participants for the improvement of the present ERP system were the involvement and participation of students in the process of implementation, utilization and performance evaluation of the ERP system. This should be made possible by training and education. Furthermore, integration needs to be improved, the ERP system should be customized

to make it more user friendly and provisions should be made for in-house maintenance of the ERP system to minimize the maintenance expenses.

CHAPTER 6 SECOND CASE STUDY (HEI_II)

6.0 Chapter Overview

As has been mentioned in the previous chapters, three higher education institutions were selected to be examined for the purpose of the study which is the implementation of ERP systems in HEIs. In this chapter, the empirical data from the HEI is used to analyse and interpret the findings to meet the aims and objectives and answer the research questions. Qualitative analysis was performed supported by the NVivo software to investigate the basic aim of study which was to assess the success of ERP implementation in Jordanian HEIs. Eleven participants were approached and interviewed after their consent and willingness to participate in the study. The primary data collected from the selected participants by semi structured interviews was analysed using a qualitative content analysis technique with the support of NVivo. In this chapter the HEI is introduced and the coding framework for the development of themes and sub themes for the purpose of analysis and interpretation of the empirical findings is discussed.

6.1 Introduction to HEI_II

HEI_II selected for the second case study was an official Jordanian HEI. This university specialized in engineering at a Bachelors and Diploma Level. It has been providing educational services since 1977, and at the time of this study 47,500 students were enrolled in the Bachelor's programmes.

There was a joint venture between Investment World for Development and Technology (IWDT) and the university, with the help of the ERP University Alliances Program (UAP). The basic purpose of this collaboration was to integrate practitioner courses for ERP practical into the curricula of business, accounting, and MIS courses.

Great efforts have been made by IWDT in combining knowledge about information systems, professional training of ERP, ERP curricula, and university courses to create relevancy in the teaching of ERP in university. Students of this course will emerge as highly qualified and skilled graduates who will be able to opt for any certification exams. Learning about ERP systems in this way will help undergraduate students to obtain a job in Jordan and in other countries worldwide. Demand for qualified and trained ERP specialists is peaking locally and internationally.

The basic aim of implementation of ERP in the university was the provision of advanced information technology services which will be supported by the best information and communication infrastructure. Technical support, network security, training opportunities will be provided to the students and researchers as per their needs and requirements. Moreover, it will be ensured that international best practices, rules and regulations will be followed by the users of the ERP system and that standards will be maintained while making collaborations and partnerships with local and international agencies.

The university network department has the responsibility for networking activities such as cabling, network infrastructure, and monitoring the Internet and intranet services provided to the university community. The network department regularly backup the operations into a unified database. Monitoring and maintenance of network devices such as routers, switches, access points, servers and load balancers are also the responsibility of the network department. Safety and security measures are also being maintained to tackle any issues of threats to the

network system. An ERP training department has also been established to design and conduct ERP training sessions for students, staff members, and the local community for the enhancement of scientific capabilities and to give practical exposure in the field of information and communication technology.

6.2 ERP Implementation in HEI-II

The first section presented the views and understanding of the participants regarding the prevailing ERP system in the university. This second section addresses the questions: what ERP system is being adopted? Why was it the preferred choice and what processes were involved in its adoption? This is in response to the first research question of the study, which was: How can ERP systems be implemented successfully in HEIs? The themes for the section were identified by the questions from the semi-structured interviews while the coding of the responses from the interviews gave birth to the emerging sub-themes (referred as parent nodes and child nodes in NVivo outputs). Table 6.1 shows the themes and sub-themes defined under this section. Discussion of the themes and sub-themes follows:

Table 6. 1 Parent nodes and child nodes in NVivo software (themes and sub-themes)

Themes (Parent Nodes)	Sub-Themes (Child Nodes)
ERP System Used	• System Information • Objectives • Users
Reasons for ERP Implementation	• Performance Improvement • Integration • Utility
Strategy to Adopt ERP System	• Approach (Phased Roll-Out)
Management's Strategy for Resistance	• Change Management • Incentives for Training • Forced Usage • No Attention to Issue
Training for ERP System	• Basics of Training • Response of Staff

All the themes and sub-themes are discussed as below;

6.2.1 ERP System Used

Technical level participants were questioned about the basic information regarding the prevailing ERP system being used in the university. Sub-themes which emerged under this theme through the responses of the participants are presented by the NVivo screenshot in Figure 6.1:

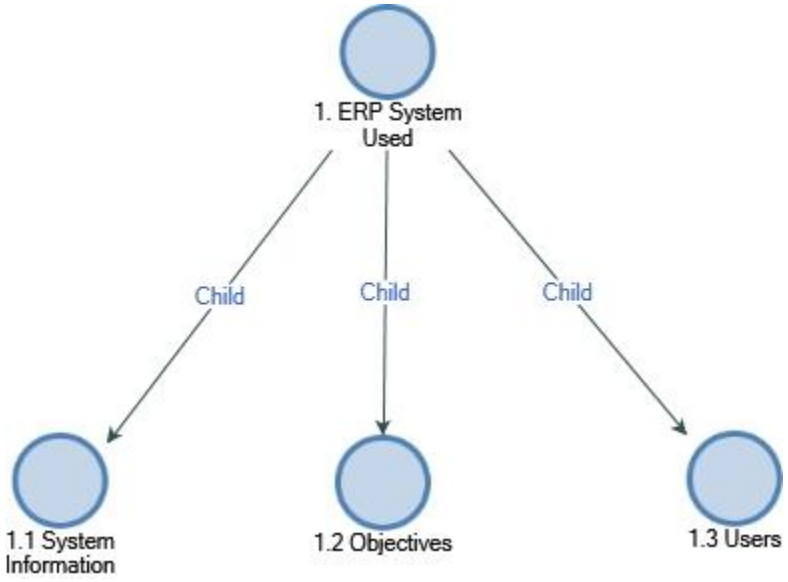

Figure 6. 1 ERP System Used and sub-themes

To provide information from different perspectives both top management and technical staff were involved as participants in the interview process.

Responses of the participants were coded as the emerging sub-themes and discussion under each sub-theme as follows:

❖ **System Information**

Only technical level respondents were asked about the basic specifications of the ERP system being used. All of the technical level participants (n=05) gave the similar information about the ERP system. For example, TL 04 commented,

"In our university, Oracle 2004 is being implemented and it has been implemented since 2004 which is a long time".

Participants also provided the information about the current phase of ERP system in their organisation. As ERP system was implemented in 2004, it was now at the post implementation phase. TL02 stated,

"Currently ERP system in our organisation is at post implementation phase."

❖ **Objectives**

Top management participants gave their views and opinions regarding the aims and objectives of the ERP system. They were mainly concerned with the strategic decisions therefore the l were well aware of the pre-defined objectives and in their view assessment and evaluation of the ERP system depended upon the achievement of objectives. In this case study, the most important objective for the implementation of ERP system was to develop an integrated system to accommodate the technological investment and adopt the best practices to make the different functions of the university more unified and user-friendly for its stakeholders. The basic aim of the ERP implementation was highlighted by TM02,

"The basic aim and objective of ERP project are the replacement of inefficient system with one that is functionally integrated, providing a state of the art infrastructure to better serve the students, faculty, staff and other members of the University community. Also, to empowering the users with more control over system functions, services and scheduling".

Similarly, in words of TM05, the aims and objectives for ERP implementation were:

"To offer improved and the combination of an accounting system that aims to give the university access to a source that depicts reliability. Embrace an integrated system that assures and guarantees freedom of choice and supports the ongoing business efficient service delivery."

One top management participant highlighted the importance of the adoption of best practice used in HEIs worldwide, for the better and improved integration of different systems and departments of the institution. As per the words of TM04,

"To offer improved and the combination of an accounting system that aims to give the university access to a source that depicts reliability. Embrace an integrated system that assures and guarantees freedom of choice and supports the ongoing business efficient service delivery."

The aim of the ERP system implementation was designing, developing, and maintaining programs, computer applications and services for administrative processes to improve productivity and transparency at the university level as presented by NVivo in Figure 6.2.

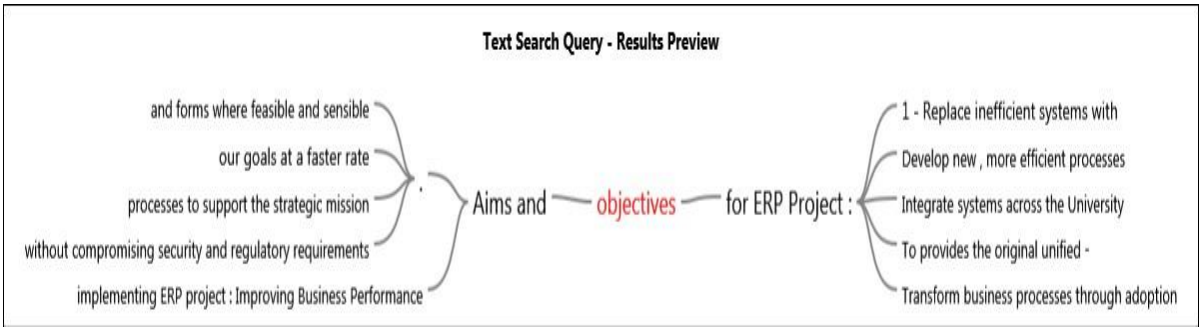

Figure 6. 2 Text Search Query – Results Preview

❖ **Users**

Technical staff were asked were the main users of ERP system in their university. Responses from the participants indicated that the staff members and students were the main users of the system. TL01, TL03, and TL04 commented,

"All the staff members including president, faculty, administrative staff, ERP committee, all the students, and alumni are the users of ERP system".

6.2.2 Reasons for ERP Adoptions

The second theme for the transcript of interviews was the reasons for ERP implementation. Participants of both levels (Top Management and Technical Level) were asked about their perceptions regarding the facts why HEI_2 has adopted this ERP system. There were four basic reasons given by the participants which were classified as the sub-themes. The presentation of parent nodes and child nodes in NVivo is shown in Figure 6.2:

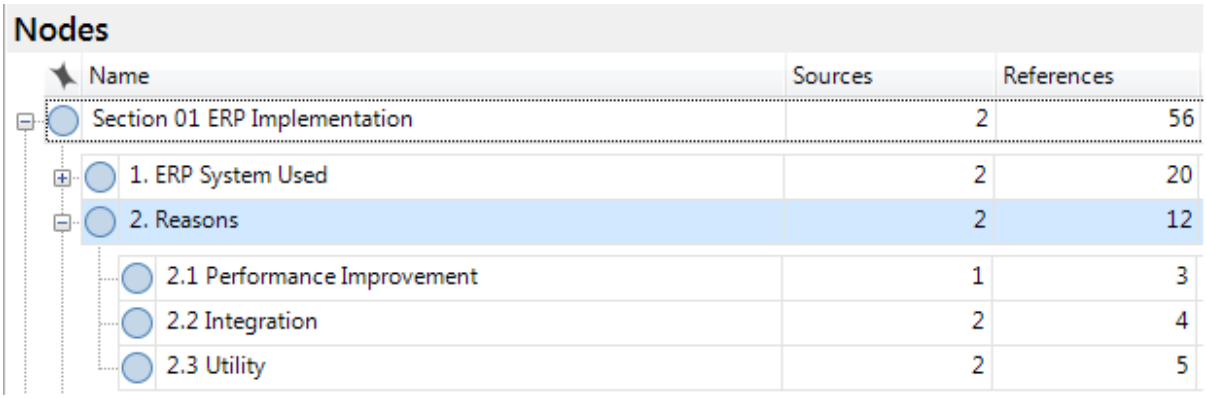

Figure 6. 3 Reasons for ERP Implementation sub-themes which are represented by the NVivo screenshot

According to TM01,

"The university has adopted the ERP system because of the improvement in overall performance and the Integration of different information systems."

❖ **Performance Improvement**

All of the participants from top management were of the view that the main reason for the implementation of an ERP system in their institution was for an improvement of organisational performance. HEI_II is a public Jordanian University and Investment World for Development and Technology (IWDT) has invested in the institution_ through the ERP University Alliances Program (UAP) for the integration of practical ERP courses in the curriculum of the university. The basic aim for the implementation of ERP was to provide advanced IT services to students and researchers. As quoted by TM02, the reason was

"The reason for implementing was to expand the efficiency of services provided. This comprises software components that enables the University to achieve its stipulated goals in a timely manner."

Similarly, TM03 stated:

“Our university implemented the ERP system for the improvement of business performance”.

❖ **Integration of organisational processes**

One of the most important benefits for the implementation of the ERP system was the integration of multiple business operations, information systems, academic activities, as well as different departments. Integration was helpful for the improvement of internal processes by making a unified and accessible database for the use of stakeholders. As per the words of TL01,

“A combined and tailored solution is enhanced for all issues arising from business, economic and cultural background. As such, the stipulated enterprise resource planning software is designed to meet all those needs and functions.”

A participant from the technical staff TL03 also pointed out the same reason by stating,

“To provide a range of services across academic and economic components that involves simple processes like planning and scheduling, learning and providing necessary guidance on articulating and tracking performance indicators, and examining the process.”

❖ **Utility**

An important sub theme which emerged during the coding of the responses was the utilization of the ERP system for admissions, examinations, learning processes, library access, evaluations, and elimination of manual processes. All these benefits were classified under the sub theme of the utility of the system for staff and students. The analysis of the responses indicated that most of the participants both top management and technical staff indicated that this feature of ERP system has provided the admin staff, faculty and students of the university with Improved accessibility of the different activities under one system. In the words of TL02,

"Reasons for adopting ERP was automating the admissions, eliminating manual processes, and saving the significant time of staff by enabling prospective students to apply online through a self-service portal".

Similarly, TM04 highlighted that, "*utilization of a completely web based system and elimination of papers and forms was a feasible and sensible advantage of ERP system".*

One of the top management participants also emphasized the benefit of secure access to data given by the system by saying,

"It provides easy access to data and information without compromising security and regulatory requirements."

The ERP system is a very helpful system for students which gives them easy accessibility for enrolment registration, payment of financial dues, library access, and interactive learning with their faculty members. In the words of TL04 and TL05,

"ERP provides a one stop student access which allow students to enrol, register and pay for courses through an online portal".

The ERP system has also engaged faculty members in the evaluation process, and provided them with facilities for the timely grading and evaluation of students.

6.2.3 Strategy to Implement ERP

The interview participants from top management were questioned about the approach which had been adopted for the implementation of the ERP system. The sub themes emerging from their responses under the theme of the strategy used to implement ERP are shown in Figure 6.4.

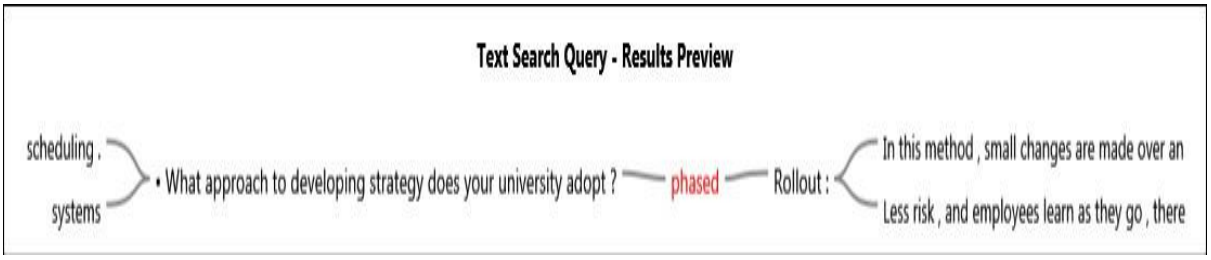

Figure 6. 4 Strategy to implement ERP system sub-themes which are represented by the NVivo screenshot

❖ **Approach (Phased Roll Out)**

All of the participants from top management gave the same response for this theme which was that the strategy used to implement ERP was a phased roll out. As per the words of TM02,

"Phased Rollout: this involves taking significant steps in the transition from old to the new system while undertaking a few changes over a planned length of time."

In the phased roll out approach the new system is implemented a module at a time and the old system is used to support the essential functions. This reduces the risk because the university can continue to complete its daya to day activities while gradually taking on the new system. As per the words of TM04,

"Phased Rollout: this requires considerable time given that it takes a quite some time for the conversion to be accomplished. Coupled with the issue of missing information, the transition experiences gaps because each module requires needs to be facilitated with timely information from other functions."

Participants also highlighted how risks were minimised and the learning process improved by the roll-out approach. According to TM04,

"With the users having an ideal time for adapting to the new system, it is vital to note that few risks were experienced and that the system supports employees learning the process as they continue adapting it."

6.2.4 Management's Strategy for Resistance

While implementing the ERP system management had to face resistance from users which were reluctant to use the new system, therefore, different strategies to motivate the users had to be applied. The strategies which emerged from that interview participants were highlighted as sub-themes. Top management had identified the following strategies which were coded as child nodes in NVivo as in Figure 6.5 below.

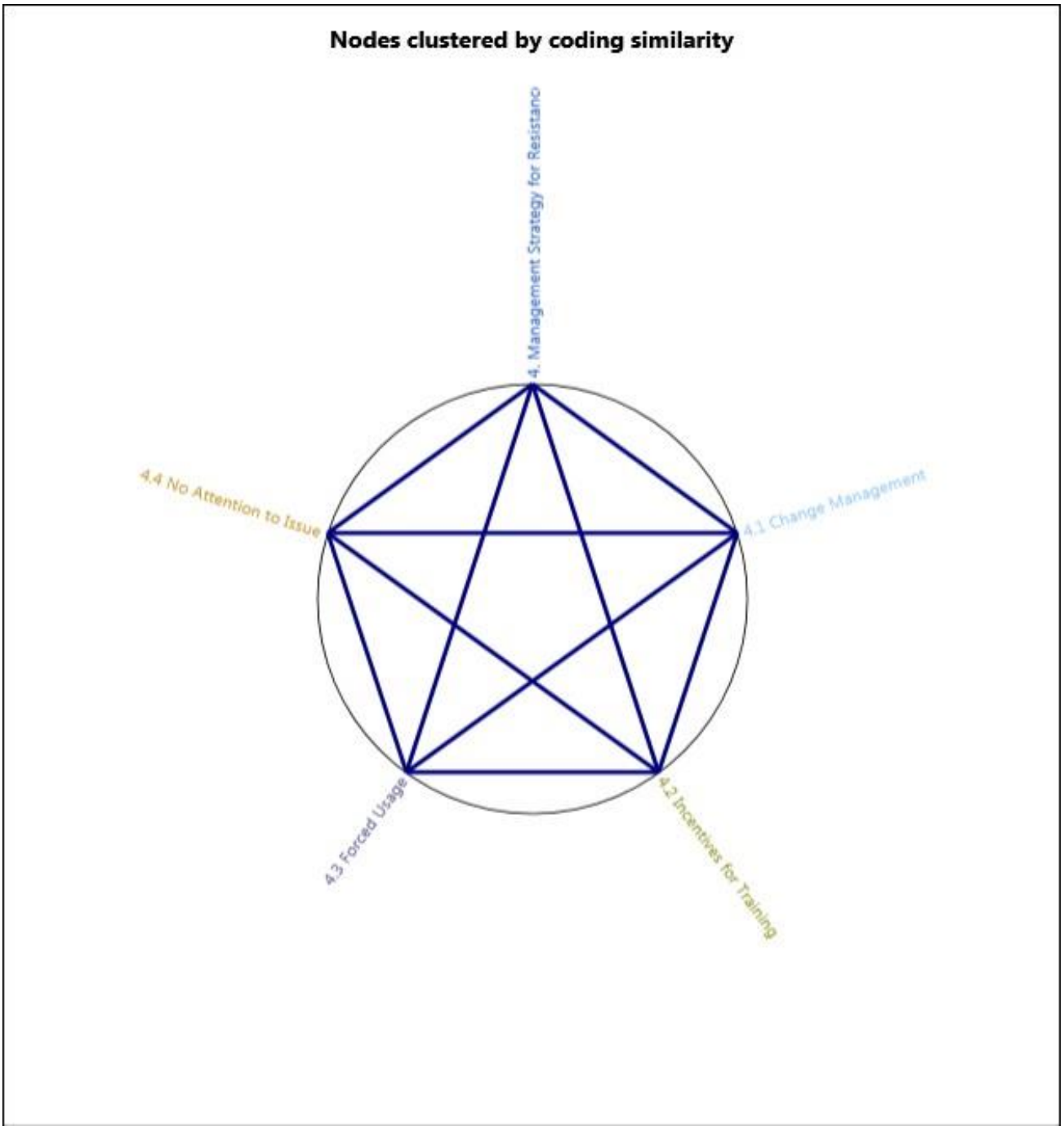

Figure 6. 5 Strategies against resistance which were coded as child nodes in NVivo.

❖ **Change Management**

One of the most important strategies pointed out by the top management participants was the adoption of a change management policy which was operated right from the beginning of the implementation to tackle the issue of resistance by users. The participants emphasized that by operating this strategy and managing the causes of resistance the impact of resistance was reduced having a positive effect on the success of the project. As said by TM02,

"Change management should be made at the very beginning of the project. Much resistance to change can be avoided if effective change management is applied on the project from the very beginning".

❖ **Incentives for Training**

The analysis of the responses from top management identified another strategy which was adopted to tackle the issue of resistance against the use of ERP system. In this strategy, an incentive was offered to the users of ERP system in the form of training. This training encouraged the users giving them practical experience to increase their use of the ERP system. As per the words of TM 04,

"Management used the strategy of providing intensive courses and supporting the staff and the student to use the ERP by giving incentives and rewards for the qualified users to tackle the issue of resistance for the use of new ERP system".

❖ **Forced Usage**

One of the top management participants highlighted the issue of forced usage of ERP system by management. Analysis showed that management "forced" the implementation of ERP system by making it mandatory that staff and students use the features of ERP system. Therefore, the users had no choice other than to adopt the system. In the words of TM05,

"They forced all the staff from all levels to use the ERP and they did the same for the students".

❖ **No Attention to Issue**

It has been witnessed in many scenarios that management adopts the strategy of not responding to issues raised as another strategy to avoid resistance. According to the interview responses of some participants, management paid little attention to the complaints and issues of the users on the basis that given time the users as they learn the ERP system the problems will go away. As per the words of TM06,

"The management didn't pay much attention to the issue of resistance by the users of new ERP system".

Similarly, another participant responded.

"The issue of resistance has not been solved yet".

6.2.5 Training of ERP System

In order to assess the provision of training and its impact on staff members, questions relating to this theme were incorporated in the interviews of top management. Basic education and training for any new information system is required to use the features of the system to the full. The Oracle 2004 ERP system was new for the staff members, therefore, management provided training courses to give them familiarity with the new system, and train them in the use of the different features of the ERP system. Sub themes emerging under the coding of NVivo are shown in Figure 6.6:

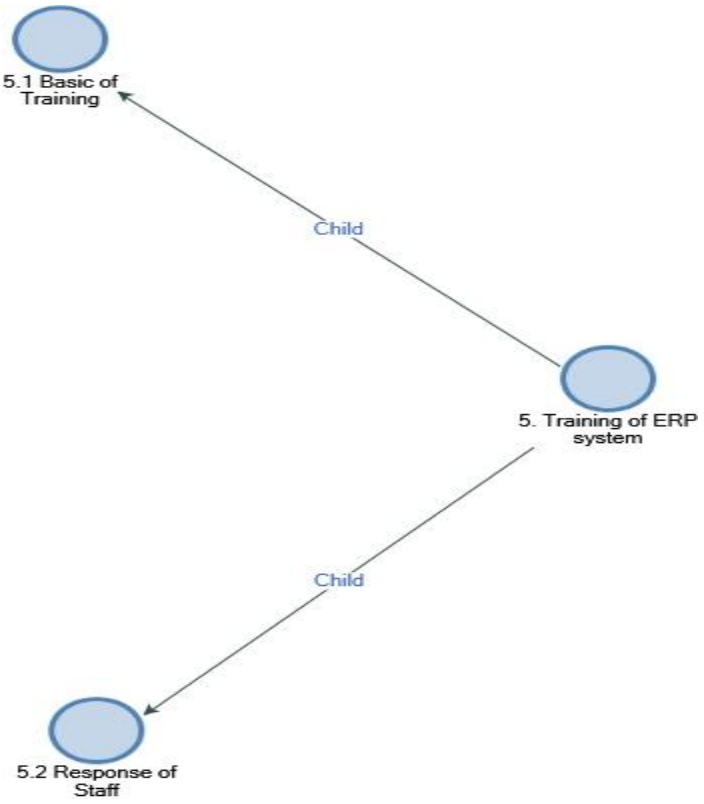

Figure 6. 6 Training of ERP System sub-themes which are represented by the NVivo screenshot

❖ **Basics of Training**

All of the top management respondents provided the information about the training provided to the users of the new ERP system. Analysis of the responses indicated that one-month intensive training was provided by the management for the users to gain better understanding of the system and this training was given by the vendor of the ERP system. As stated by TM01 to TM06,

"Intensive training of one month has been given to users by the vendor of ERP system for better understanding and use of different features".

❖ **Response to training**

It was important to assess the response of the users toward the training courses to have a better understanding in respect of resistance to the adoption of the ERP system by the users. Some of the respondents were of the view that the training for the ERP system helped the staff members to obtain a better understanding of the technicalities of the system and its usage. In the words of TM01 and TM02,

"Training and education suggest the formal transfer of knowledge, some disparities can be noted between them."

One of the participants highlighted the benefit of web based e-learning and real time interactions in the training courses by saying:

"The ERP training was conducted over the web and the e-learning enabled the learners to interact with the instructors and other users via the online platform." TM04

One of the participants was of the opinion that some staff members hadn't responded well towards the training for the new ERP system because they preferred their current way of working.

"Some of the staff members responded positively and some responded negatively as they were old staff and they didn't like the new system" TM05.

One of the important aspects highlighted from the staff responses was that the busy schedules of staff members didn't give them time for training as stated by TM 06,

"Many staff members didn't pay much attention to the training because of their heavy daily tasks".

Trained staff members were supposed to train the other staff but it seemed that this task also got affected due to their busy schedules. In the words of TM03,

"Training was not given to all the staff members, it was only for the technical staff and those who received the training were supposed to train the other staff members but they didn't do this due to their busy schedules".

6.2.6 Summary of section 6.2

By summarising section 6.2, it was concluded that the Oracle 2004 ERP system was implemented in the HEI and was in its post implementation phase. The basic aims and objectives of the system were the facilitating the operations of staff, faculty, and students of the University by integrating and the information and systems of the different departments into one database. All the students, staff members, and faculty members are the users of the ERP system. The main reasons

for the implementation of the ERP system were the improvement in overall performance of the organisation, integration of overall business processes and providing utility for the users. The phased roll out approach was adopted to implement the system while the management adopted the strategies of change management, incentives for training, forced usage, and paying no attention to issues, to handle the resistance from users of the new ERP system. Staff members were intensively trained for one month in the understanding and use of the different features of the new system. A mixed response was witnessed from the staff members in respect of training because it had an impact on their busy schedules as illustrated in the below figure 6.7.

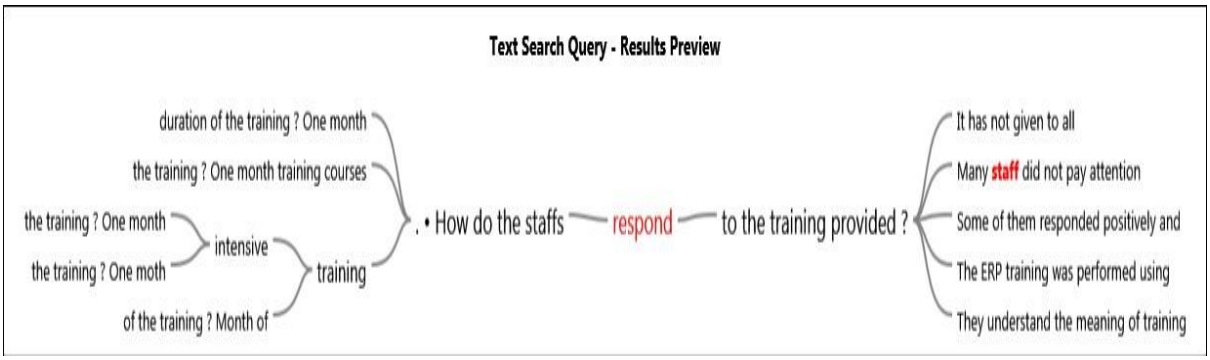

Figure 6. 7 Summary of 6.2 through NVivo results

6.3 Key Success Factors for the ERP Implementation

This second section addressed the second part of the first research question which was: What are the key success factors influencing the effective implementation of ERP systems in HEIs? All the participants of the study, whether top management or technical staff were asked about their views for the identification of the factors that lead to successful ERP implementation.

The themes for this section were identified by the questions from the semi-structured interviews while the coding of the responses from the interviews produced the sub-themes (referred as parent nodes and child nodes in NVivo outputs). The themes and sub-themes are shown in table 6.2.

Table 6. 2 Factors in Successful ERP as parent nodes and child nodes

Themes	Sub-Themes
Technical Factors	• IT Infrastructure • Information Quality • system Quality
Organisational Factors	• Change Management • Training and Education • Organisational Culture • Business Process Reengineering
Project Factors	• Project Management • Budget • Time • Right ERP
Project Support System Factors	• Top Management Commitment and Support • Qualified IT Staff • Vendor Relations

Detailed explanation and analysis of each theme and sub-theme are given in the next section.

6.3.1 Technical Factors

Participants of the qualitative study identified the basic factors of technical support and the availability of technical resources for the success of ERP implementation. The important technical factors from the responses were classified as the sub-themes. The NVivo representation of these sub-themes is shown in Figure 6.8.

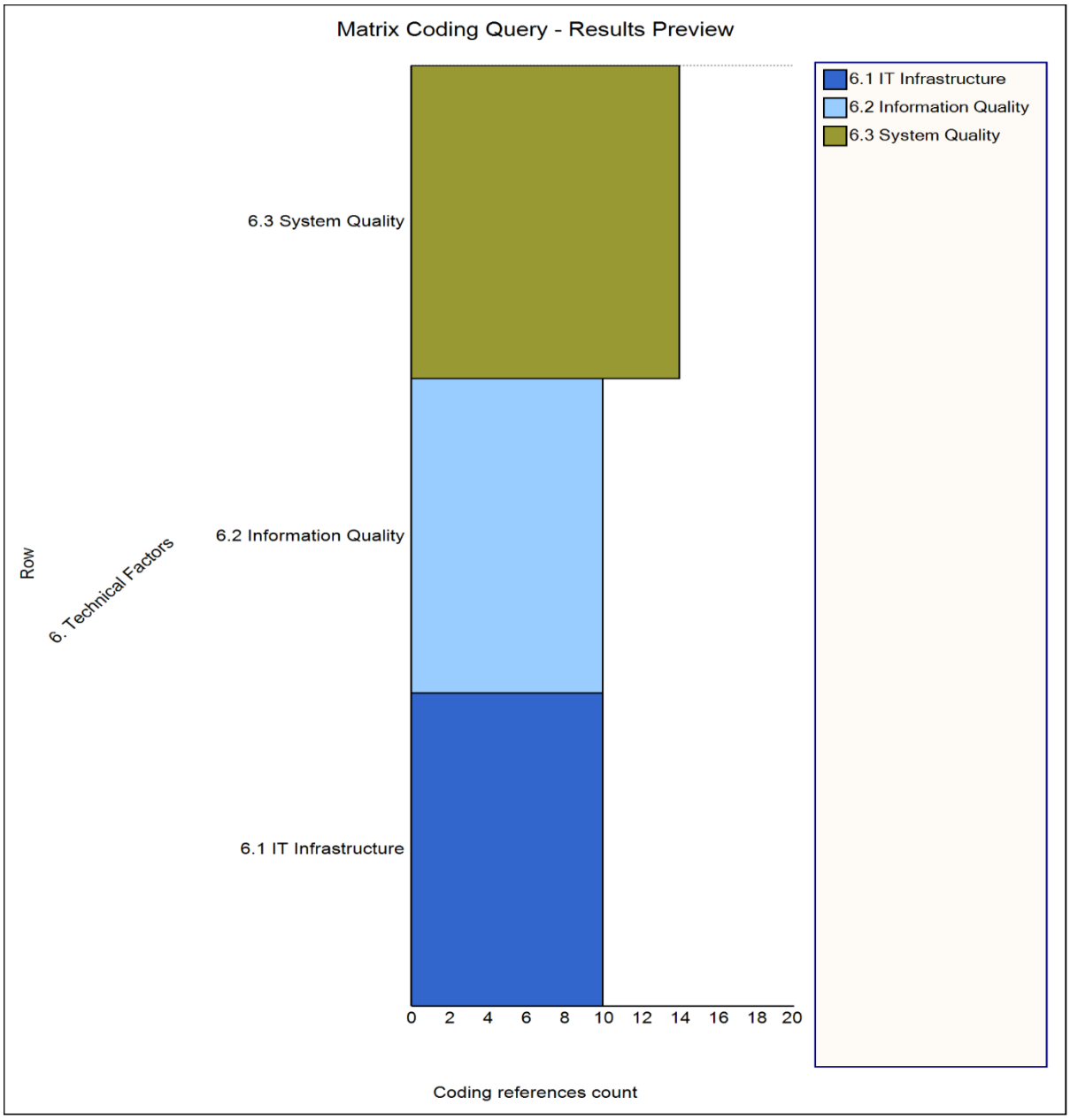

Figure 6. 8 Technical factors for successful ERP sub-themes which are represented by the NVivo screenshot

❖ **IT Infrastructure**

In order to implement an ERP system in an educational institution, the availability of technical resources and their best utilization can be considered as the key factor. The need for a suitable IT infrastructure which is kept up-to-date cannot be ignored. Participants from top management and technical staff identified the need for IT infrastructure for the successful implementation of the ERP system. As per TM05,

"An updated IT infrastructure is the basic requirement for the successful implementation of an ERP system in an organisation"

All of the participants were given the option to prioritize the technical factors as high, medium and low according to their knowledge and personal experience in the organisation. Most of the participants ranked the factor of IT infrastructure high level. In the words of TL04 and TL05,

"IT infrastructure is the most important factor which cannot be neglected while planning for the implementation of the ERP system in any organisation, therefore IT infrastructure should be ranked high in priority list".

Similarly, TM01 and TM02 stated:

"I'll rank IT infrastructure as a highly important technical factor in my priority list".

Technical support and continuous maintenance of the equipment was also highlighted by some of the participants. As in the words of TL01,

"In any organisation, IT infrastructure requires technical support and maintenance on daily basis and delay in this technical support can cause difficulties in the smooth running of the ERP system".

- **Information Quality**

The quality of the output and the perceived performance of the ERP system depend upon the quality of the information fed into the system. Clear, standardized, relevant, accurate and true information will enhance the quality of the output produced. As in the words of TL03 and TL05,

"Good quality information can enhance and accelerate the performance of ERP system, whereas any error at the time of input of information can affect all the modules of the system".

Similarly, TM02 and TM03 stated that,

"The effect of this factor is retrospective and can cause problems for the success and achievement of goals".

The majority of the participants were of the view that this technical factor should be ranked high on their priority list.

In the words of TL04 and TL05,

“The quality of information is highly important and it should be given eight out of ten on the priority scale”.

- **System Quality**

The views of the participants gave the idea that quality of the ERP system is also an important technical factor which can also have an impact on the perceived success of the ERP implementation. Achievement of goals and objectives depends upon the quality of ERP system. According to TM01 and TM02,

“No one can achieve pre-defined goals and objectives from a poor quality ERP system”.

Responses of the participants indicated that most of the top management and technical staff were satisfied with the quality of the ERP system. In the words of TM04 and TL05:

“Oracle has been implemented since 2004, and it is a good quality ERP system as per the requirements of the university.”

Similarly, participants TL02 responded,

"Although there are some issues in the system, this system has proved its worth by its performance."

The majority of the participants ranked this factor high on their priority list,

"I will give this technical factor 08 out of 10 on the priority scale." - TM05

"This technical factor has a high importance for the evaluation of the success of ERP." - TL01

6.3.2 Organisational Factors

There are some general features for every organisation, and also every organisation exhibits some unique characteristics which make that organisation distinctive in the organisational

community. Organisational factors relate to the progress and development of an individual in an organisation as well as the growth of the organisation and achievement of its goals. The relevant sub-themes which emerged under organisational factors for the successful implementation of ERP are shown in Figure 6.9.

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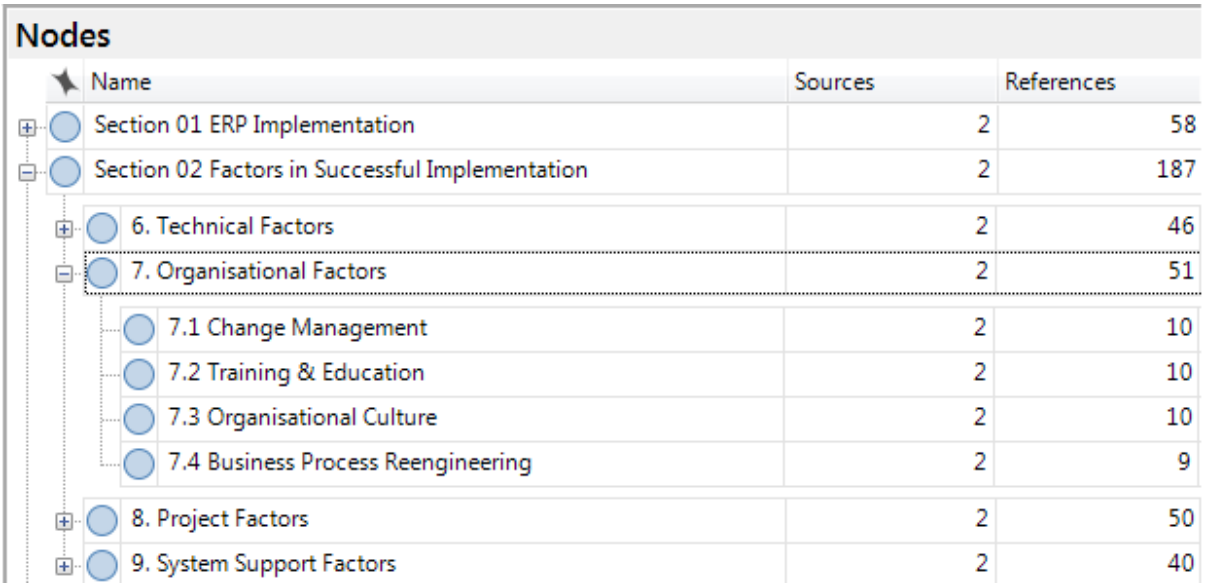

Figure 6. 9 Organisational factors for successful ERP sub-themes

❖ **Change Management**

In order to implement any new system, the business processes and operations of the organisation need to be changed. The management of change can help in the successful implementation of ERP. In order to introduce change, proper management and planning is needed within the organisation

In the words of TM01 and TL01,

"The organisation adopted the strategy of change management right from the beginning of the ERP project. This is very important to identify the areas where more attention and efforts are needed to make the change successful".

Similarly, participants were of the view that proper and appropriate management of change can facilitate the achievement of goals through ERP. In the words of TM02,

"Predefined goals and objectives can be achieved through the ERP system if the change has been properly managed within the organisation".

All of the top management participants gave a high priority to this organisational factor e.g. *"Management of change should have the high priority in organisational factors" TL04.*

"I think organisational factor or change management should be given nine out of ten on the scale of priority and importance" TL02.

While some of the technical level participants were of the view that this organisational factor should have a medium level priority.

"Six out of ten will be enough for this factor on priority scale" TL03.

- **Training and Education**

In order to update the users with the new and advanced technologies, on-the-job training and the updating of existing knowledge can be considered as a key factor for the personal growth of the individuals as well as the organisation. Analysis has revealed that education and training can enhance and increase the chances of the success of the ERP system for the achievement of its predefined goals and objectives. In the words of TM02 and TL03,

"Training of technical staff can improve the organisational success of ERP system"

"Well educated, well trained and well equipped technical staff can be in a better position to serve the organisation and making the ERP system successful".

The majority of the participants ranked training high on their priority list

"Nine out of ten should be given to the factor of training and education for ERP system" TM03.

Knowledgeable and trained users can make the implementation of ERP system successful, therefore, these are highly influential factors.

❖ **Organisational Culture**

Organisational culture can influence the growth and development of employees. All of the participants were of the view that maximum use of the ERP system should be encouraged. In the words of TM01 and TL02,

"To get the necessary support for ERP implementation, the organization needs to nurture a culture of power sharing. Within the organization, the possession of information is regarded as an important source of power. Making people share their information with each other requires a culture with little focus on the turf, politics and status".

In respect of prioritizing the factor, this specific organisational factor had mixed views and opinions as half of the participants ranked it high and the remainder had ranked it medium on the priority scale.

"I'll give this organisational factor eight out of ten" TM02.

"This organisational factor has medium level of importance for the measurement of success of ERP system" TM04

❖ **Business Process Reengineering**

In order to incorporate a new system in an organisation, the need arises for the re-engineering of the different processes of the organisations. This organisational factor was identified as an important and influential factor for the measurement of success of the ERP system. In the words of TL04,

"Implementation of ERP system can get influenced if the business processes are not re-engineered in a timely manner"

Implementation of the new system needs places new demands on the organisation to make necessary adjustments to their processes for the successful implementation of the system. According to TM01,

"Business process reengineering is the result of meeting the requirements of the new system".

6.3.3 Project Factors

Implementation of an ERP system in an HEI is a project which should be pre-planned, implemented and then assessed as per the standards of any project. The responses of participants identified some emerging sub themes under the theme of project which are shown in Figure 6.10.

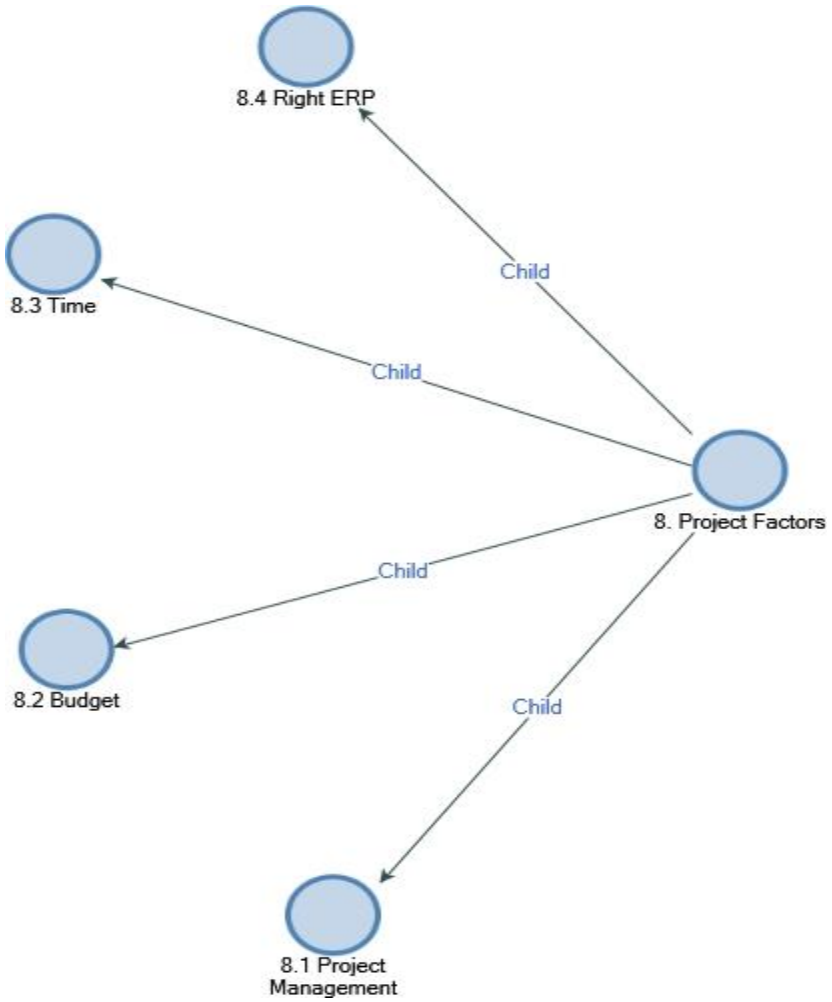

Figure 6. 10 Project Factors for successful ERP sub-themes

❖ **Project Management**

As the implementation of an ERP system is considered to be a project, proper management is required to make the project successful. As illustrated by TM03,

"Some predefined procedures should be followed during the implementation phase to make the project successful".

Analysis of the responses has highlighted that project management involves planning, implementation, evaluation, and maintenance processes to make the implementation of the project successful. According to TL02,

"The management of the project ranges from the process of planning to the process of continuous maintenance".

"Project management involves assessments for the available resources, utilization of resources, monitoring and evaluation of project". TL04

All of the participants gave this project factor high importance on their priority list.

"Factor of project management is highly important and influential for the measurement of success of ERP system" TM01.

❖ **Budget**

The provision of adequate finance for the implementation of any project introducing change to an organisation is a success factor which should given special attention at the planning stage. Analysis of the interview responses revealed that some of the participants viewed cost as a measure of the success of an ERP implementation. Any system where the costs of adoption are greater than the benefits received cannot be termed successful. In the words of TL03,

"The cost of the project must not over shadow the benefits of the project".

It was also highlighted that sometimes the benefits of the projects cannot be measured immediately but can only be witnessed over the long run. According to TL02,

“Finances incurred for the project must justify the benefits and advantages gained at the end of the project”.

❖ **Time**

Participants also discussed the importance of time management to make the project successful. According to TM 01 and TM02,

"The ERP system integrates all the operations at the same time irrespective of their demographic locations, therefore, any issue in this respect can hamper the effectiveness of ERP system".

“Time management is an art in which mastery is required to make a project successful and effective”.

Mixed views and opinions were given regarding the priority of this project factor. Some participants gave this factor high importance while others ranked it as medium on the priority scale.

❖ **Right ERP System**

Analysis of the responses of the participants revealed that all of the participants were of the view that selection of the right ERP system is the most important project factor which should be given a high priority. The HEI adopted Oracle in 2004 as an ERP system, which has been proven to be the right choice. In the words of TL05,

“An ERP system can be best in one context but can be a failure in another context, therefore, it is important to choose the right and appropriate ERP system”.

Similarly, participants were satisfied with existing ERP system because this system has been fulfilling the needs and the requirements of the organisation for a long time. In the words of TM04,

“Most of the requirements of our university are being met by Oracle, therefore the right choice of ERP system has benefitted the university and enhanced the overall performance of institution”.

All of the participants were of the view that the selection of the right ERP system, appropriate for the needs of the HEI is the most important and influential factor for successful implementation.

"Choice of right ERP is highly important for success and improvement of organisational performance" TM01.

"Ten out of ten should be given to this factor because all the efforts go in vain if the right ERP has not been selected at the time of planning and purchase" TL04.

6.3.4 Project Support System Factors

In order to make the implementation successful and effective for improving the performance of the HEI, the continuous support of the system by management and staff is an important aspect which should be considered at the time of evaluation. Some important success factors emerged from the responses of participants for the theme of project support. These success factors are represented by the sub-themes identified by the Nvivo software which are shown in Figure 6.11.

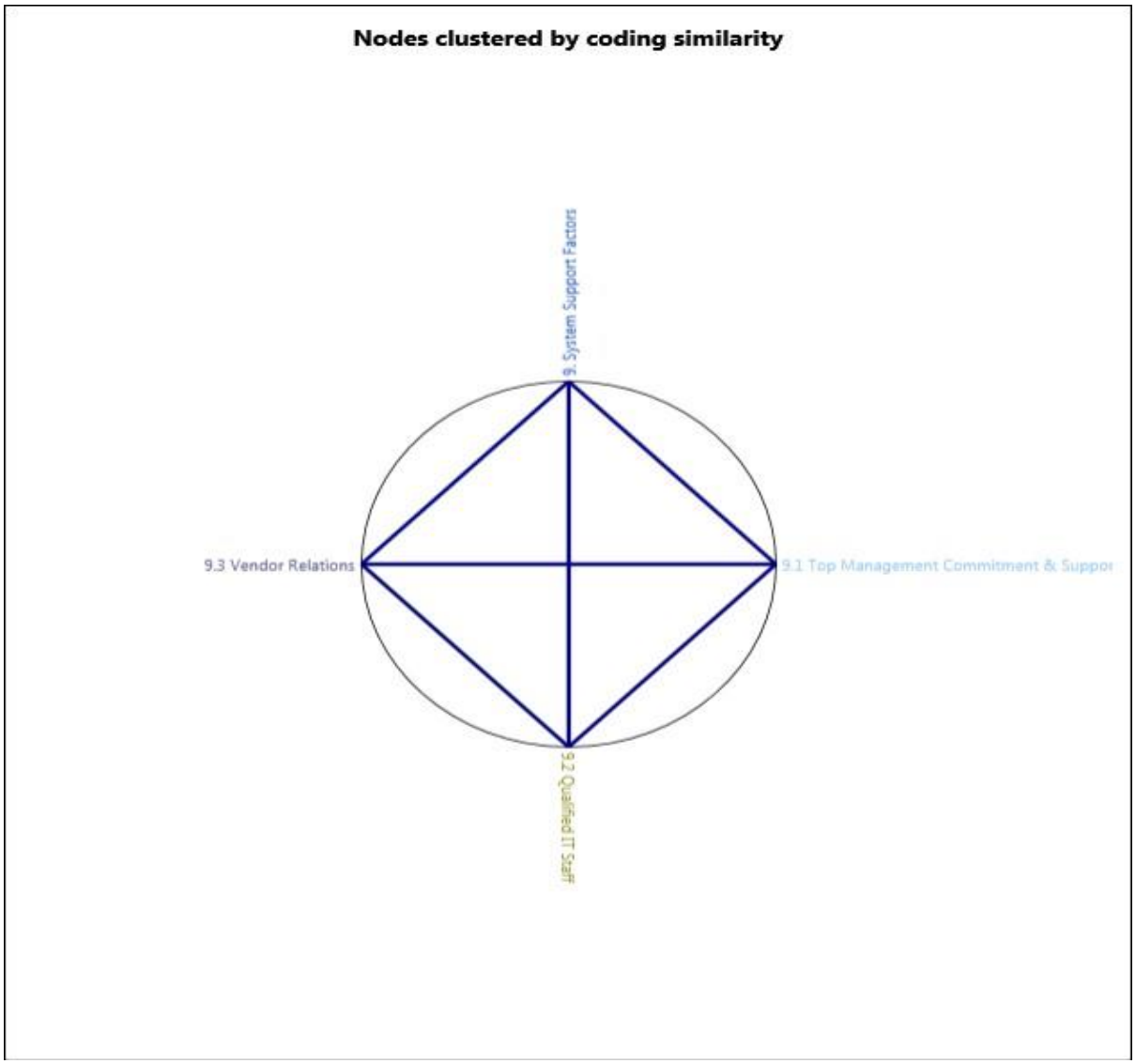

Figure 6. 11 Project Support System factors for successful ERP sub-themes

❖ **Top Management Commitment and Support**

The implementation of a system requires continuous assessment and monitoring, therefore, it is a lengthy and continuous process. Mostly implementation is divided into different phases and 100% support and commitment by top management is required in all these phases. In the words of TM05 and TM06,

“Sometimes top management only uses its attention and concentration in some of the phases of implementation of the system which can affect the overall success of ERP system".

Analysis of the responses showed that participants considered that commitment by management during the implementation would ensure the provision of accurate, relevant and reliable information for decision making afterwards. According to TL03,

"The ERP system can be used to get help in the decision-making process, therefore, their commitment can lead to the accurate results for well aware decisions”.

❖ **Qualified IT Staff**

Maximum utilization of the ERP system can be achieved if the end users of the system are competent and qualified to use the system. As per the words of TM02,

“The ERP system cannot be made successful without the appointment of qualified IT staff because they have to use the system at its fullest”.

Similarly, some of the participants identified that qualified IT staff will have the experience and knowledge for the monitoring and evaluation of the system. According to TL05,

“Qualified IT staff can trace down the errors and short comings in the system,”

“Timely rectification of process errors or in the input of information is the job of qualified IT staff of the system" TL01.

"In order to give the support needed for the system, the factor of qualified IT staff should be given high priority on the scale".

❖ **Vendor Relations**

In an HEI, vendors are approached to provide an ERP system which meets the demands of the institution. Participants gave their view that the right relationship between the institution and vendor can help in the successful implementation of the ERP system. In the words of TM06,

"There should be a cooperative relationship between institution and vendor after the purchase of ERP system".

Similarly, participants highlighted the need for the training of newly appointed staff members. This training should be given by the vendor of ERP system to the staff members of the institutions. In the words of TL01,

"Institution must utilize its relationship with the vendor to enhance the training programs of ERP system users".

Mixed views about the prioritization of this factor emerged in the responses of participants, these views ranged from high to low priority.

6.4 Mapping Key Success Factors across the life cycle phases of ERP Implementation

6.4.1 ERP implementation life cycle phases

The third section of the analysis was developed to answer the research question, what are the problems that HEIs are facing in the implementation of ERP systems? Or this purpose, the implementation of ERP system was broadly divided into Pre-Implementation, Implementation, and Post-Implementation phases. The pre-implementation phase was comprised of the initiation and adoption stages. The implementation phase was comprised of the implementation and shakedown stages. The post-implementation phase was comprised of the evaluation and optimization stages. The basic themes of implementation were identified as well as the basic sub themes in the form of stages were also pre-defined. The coding of the responses from the participants produced the emerging sub themes which were categorized under each phase and stage of the ERP implementation. Different challenges and obstacles were faced by the organisation at each phase and stage of implementation.

Participants from the technical level were questioned for their views and perceptions about the challenges faced by the organisation at each implementation phase and subsequent stage for the identification of important challenging factors in the success of ERP systems. Pre-defined themes and emerging sub themes identified during the coding and analysis are shown in Table 6.3 and the Figure 6.12.

Table 6. 3 Themes, and sub-themes of the life cycle for the Implementation of ERP system

Themes	Sub-Themes

Pre-Implementation Phase	• Initiation Stage
	  ○ Project Factors
	  ○ System Support Factors
	• Adoption Stage
	  ○ Project Factors
	  ○ Organisational Factors

Implementation Phase	• Implementation Stage
	  ○ System Support Factor
	  ○ Organisational Factors
	  ○ Project Factors
	  ○ Technical Factors
	• Shake Down Stage
	  ○ System Support Factors
	  ○ Project Factors
	  ○ Technical Factors

Post Implementation Phase	• Evaluation Stage
	  ○ System Support Factors
	• Optimization Stage
	  ○ System Support Factors
	  ○ Technical Factors

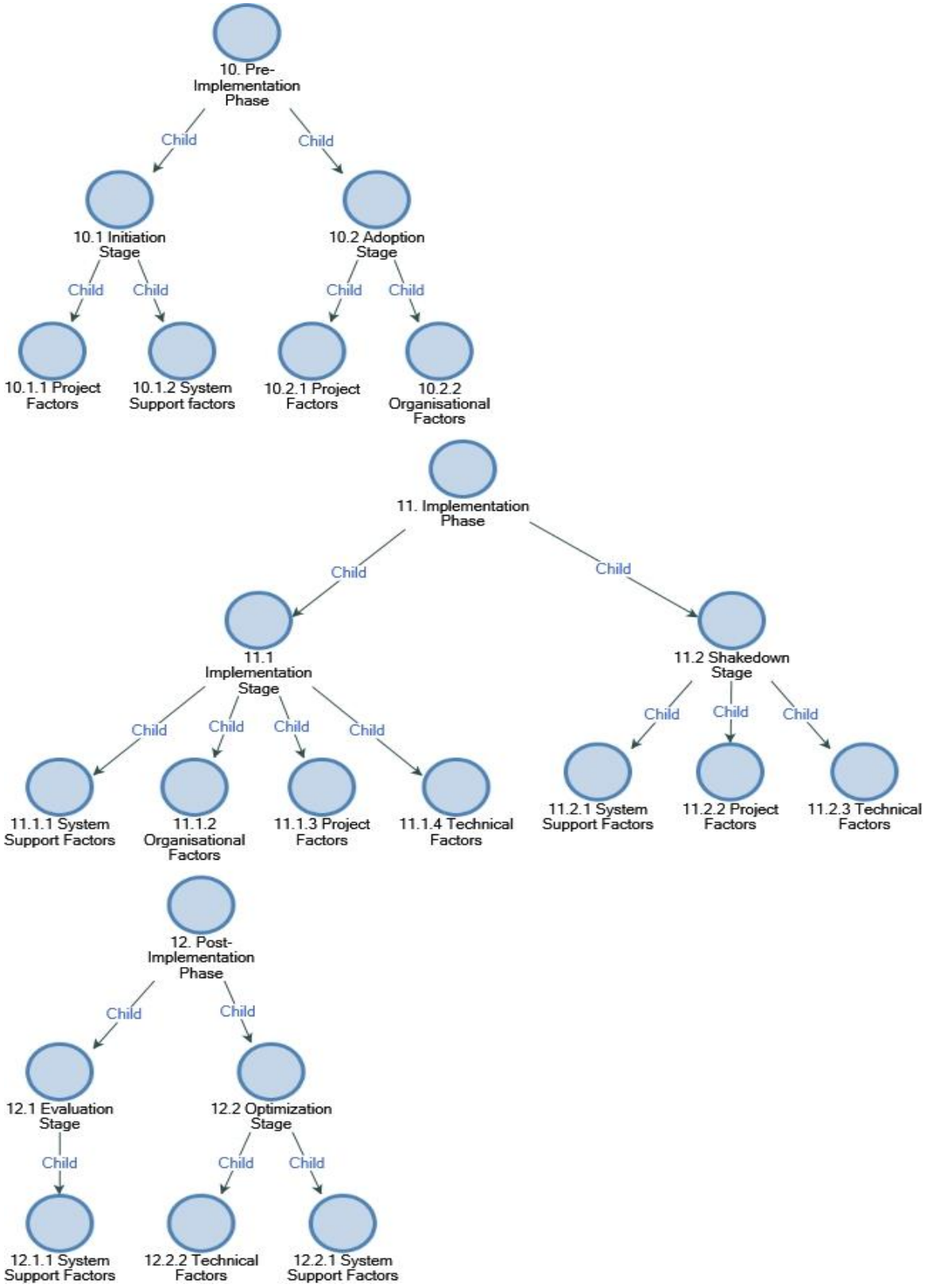

Figure 6. 12 Themes and emerging sub themes identified during the coding and analysis

6.4.2 Mapping ERP Implementation factors on ERP Implementation Life Cycle Phases

The participants of the study were questioned to prioritize the success factors for each of the ERP implementation phases. Analysis of the prioritization revealed that participants identified different influential factors for different stages and phases of the ERP implementation. For instance, the pre-implementation phase had two stages that were initiation and adoption. At the stage of initiation, project factors of budget and, right ERP selection were highlighted.

Similarly, from the system support factors, top management commitment was prioritized against this stage.

For the adoption stage, project factors of budget and right ERP was important and for the organisational factors priority was given to organisational culture, training and education, and business process re-engineering.

Mapping of the implementation phase identified that the implementation stage had challenges in all of the four identified factor categories. For system support factors: qualified IT staff, vendor relations, and top management commitment was prioritized. For organisational factors: change management, business process re-engineering, training, and education had the importance. Similarly, for project factors: project management and time were identified as the important factors. Finally, for technical factors: IT infrastructure was identified as the most important.

The next stage of this phase was the shakedown stage in which three factors were identified by the participants. Qualified IT staff was given a high priority as a system support factor, project management and time were given importance under project factors, while system quality was pointed out as an influential technical factor. For the post implementation phase system support factors were given importance from which top management commitment and qualified IT staff were given priority.

Similarly, for the stage of optimization, system support factors and technical factors were identified in which qualified IT staff and vendor relations was important for system support whereas information quality was emphasized under technical factors at this post implementation phase.

A matrix coding chart representing the importance of each factor and its priority is show in Figure 6.13 for each phase of the ERP implementation life cycle.

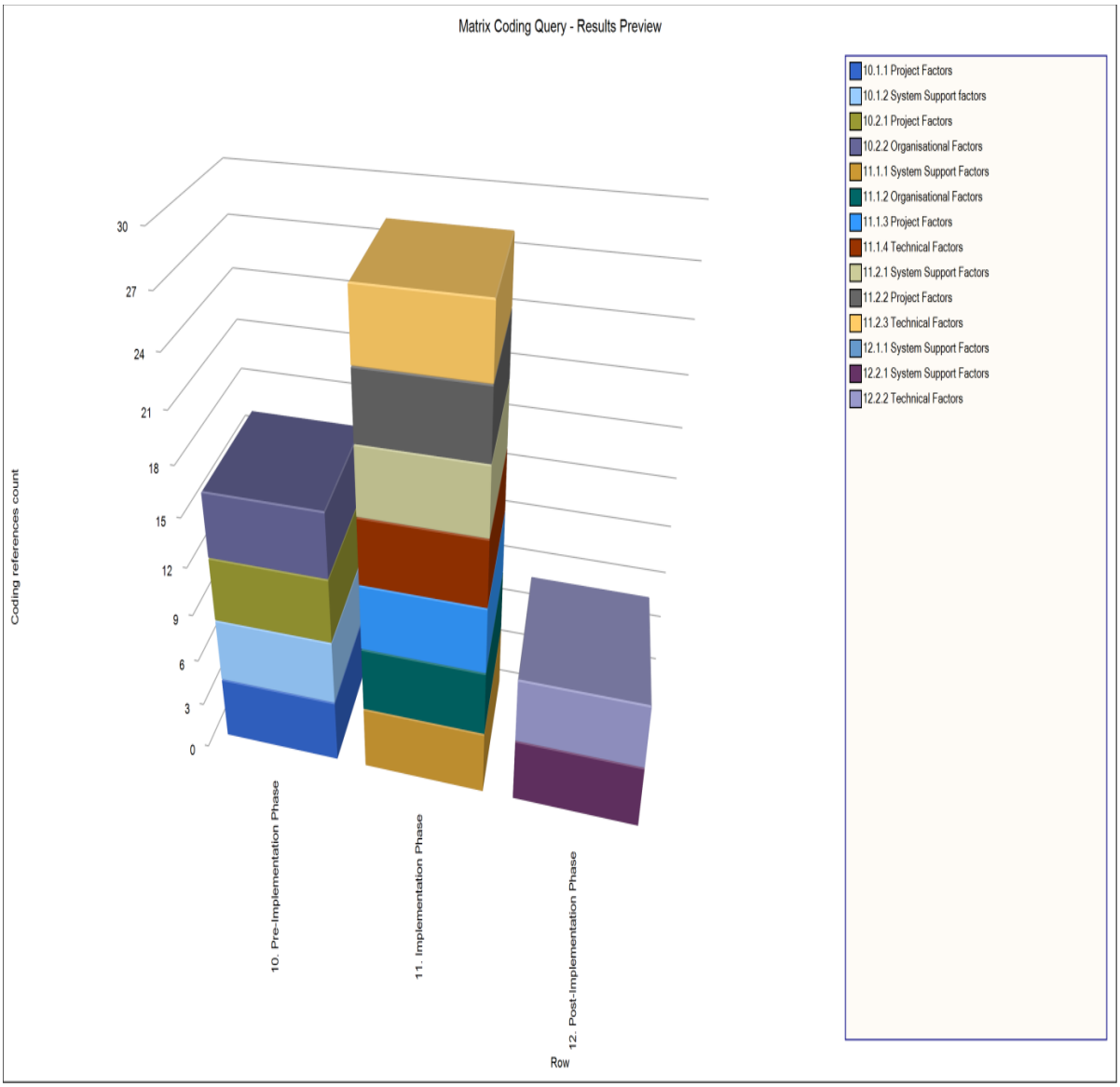

Figure 6. 13 Matrix coding chart showing the importance of each factor and its priority

6.5 Issues in Use of ERP system

Some challenges have been already identified for the implementation of the ERP system. This section highlights the issues faced by the users. The interview questions identified some basic themes to be analysed and interpreted. Analysis of the responses revealed that some of the issues were at the organizational level, some were of a personal nature and some were related

to technical difficulties. Some of the important sub-themes emerging under the predefined themes for this section are presented in Table 6.4.

Table 6. 4 Themes and sub-themes of issues and problems in use of ERP system

Themes	Sub-Themes
Problems in Using ERP	• Resistance to Change • Maintenance Costs • Integration • Compatibility • Poor Communication
Maintaining ERP	• Expenses • Qualified IT Staff Support • Right System & Right Vendor
Transfer of information from old information system to New ERP	• Data Migration Approach • Difficulties

6.5.1 Problems in Using ERP

While coding the responses of the top management and technical staff, some important organisational factors, personal factors, and technical factors emerged which the problems in the use of the ERP system. Participants were also of the view that these issues were affecting successful implementation by limiting the use of the different features of the system. The emerging sub themes identifying the problems in the use of ERP system are presented in Figure 6.14.

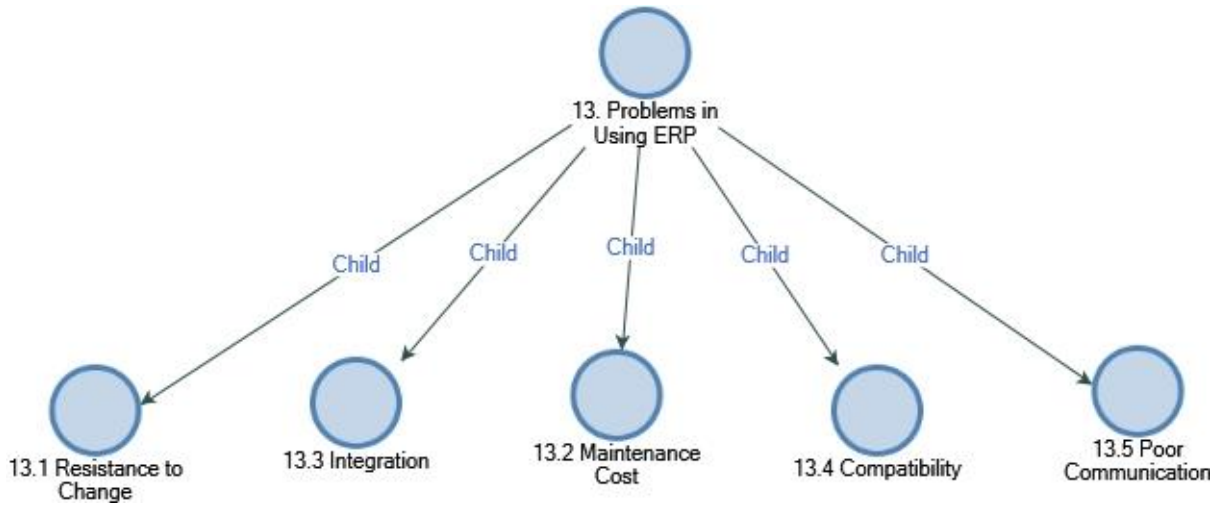

Figure 6. 14 Sub-themes observed as problems in using of ERP system

❖ **Analysis of Sub Themes of Problems in Using ERP System**

The coding of the responses led to the identification of the problems affecting the use of the ERP system, which were: resistance to change, integration, maintenance cost, compatibility, and poor communication. The NVivo analysis of these sub themes is presented in figure 6.15.

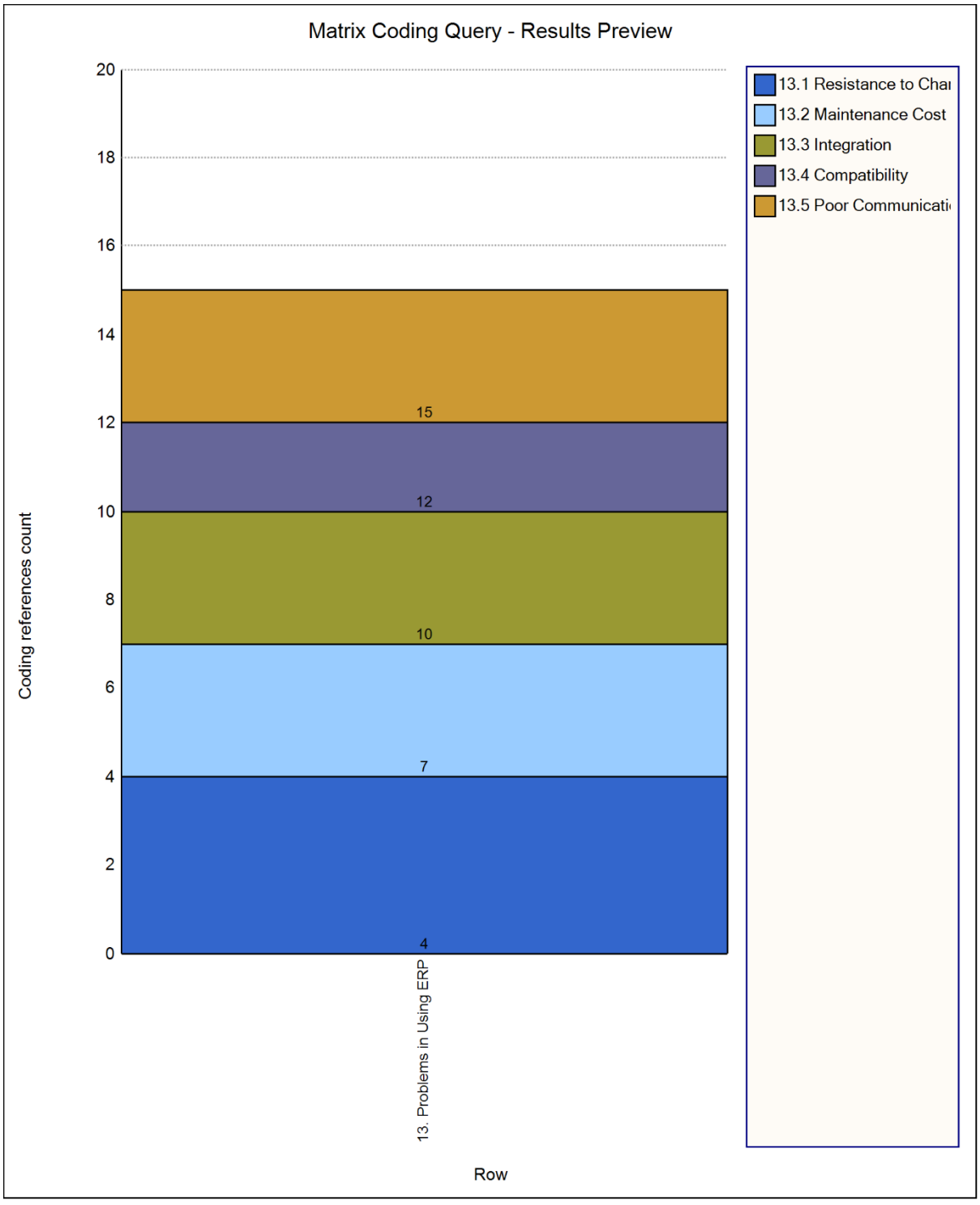

Figure 6. 15 Matrix coding query chart analysed through the NVivo 11 software

The matrix coding query chart presents the relationship between the themes and sub themes. The chart shows that the following problems were identified by the participants. The reference count identifies the percentage of the participants who agreed with the issue being a success factor for ERP implementation.

For the sub theme of resistance to change TM04 stated,

“The organisation faced the issue of resistance to change at the beginning but after top management provided an intensive course of training, this problem was solved”.

“At the beginning staff were not ready for the change” TM05.

For the issue of the maintenance cost, TL01 stated,

"Maintenance is expensive for the ERP system, technical issues like bugs in the software also requires expensive solutions.”

In the words of TL02,

“Budget constraints and reduced allocation for infrastructure could lead to the case of poor application speed and software related issues.”

“In addition to software, hardware maintenance is also expensive to maintain” *TL02.*

In respect of integration issue, TL03 responded,

“ERP integration was the central problem identified in this system. The first contest involved the process of identifying and implementing an ERP software with the knowledge of the processes and the systems that would work and those that would not.”

In the words of TM01 and TM02,

"Excessive customization of software leads to the problem with its usage and lack of cohesion in terms of internal integration of software".

The issue of compatibility was addressed in these words by TM06,

“System is very sophisticated and it’s not easy to learn”.

TL05 pointed out,

"Lack of understanding of our own business needs and processes was an issue in choosing the appropriate software for the organisation".

Poor communication was highlighted in the words of TM01,

"One of the important issues in using ERP system can be the poor understanding of business implications of ERP system across the university and its utilization for the improvement of business processes and communication".

TM03 stated,

"Poor communication between the head of the university and technical staff can be an issue which can affect the use of ERP system".

6.5.2 Maintaining ERP

Any computer aided system requires continuous maintenance for its effective usage. This maintenance is not always an easy task to perform and there are a number of which were identified by the interview participants. The coding of these responses identified the following sub themes which are presented in Figure 6.16.

Figure 6. 16 Issues in Maintaining ERP

❖ **Expenses**

Responses by the technical staff participants identified that the maintenance cost and ongoing running were important issues which hindered the perception of success of the ERP system. As per the words of TL01,

"The hardware components and other equipment quoted for the ERP system were underquoted. In this case, there is a need for computer systems because of the problems experienced. The problems ranged from a misunderstanding on general and basic maintenance and the upgrade of the system. Secondly, lack of a budget for these extended services attributed to the case of lack of proper storage an aspect that such a system needs."

❖ **Qualified IT Staff Support**

In order to maintain the ERP system and achieve the best possible results, support is required on a daily basis from the technical staff of the IT department. The technical staff need to be well qualified and trained to render the required support and maintenance of the system.

The analysis of the responses indicated that there was a lack of trained technical staff to provide the support and maintenance required. In the words of TL02,

"The failure to engage competent consultants to evaluate the best practices for the usage of the software or to make recommendations for the implementation affected the success."

❖ **Right System and Right Vendor**

Analysis of the responses indicated that it is most important to select the right system from the right vendor. In addition to the one-time purchase, a regular productive relationship with the vendor of the ERP system was essential for the on-going maintenance and use of the ERP system. In the words of TL04 and TL05,

"There should be a meeting of minds between technical staff of University and ERP software vendor. This will result in a truly positive business partnership. The fit between ERP vendor and customer is crucial and works in both ways. In order to avoid the ERP software problems; avoid the wrong software and avoid working with the wrong vendor".

6.5.3 Transfer of Information from Old Information System to New ERP System

Technical staff participants were questioned about the transfer of information from the old information system to the new ERP system. This important aspect of the implementation cannot be ignored because the quality of the output from the system depends upon the quality of information which has been transferred into the system. Coding revealed the following sub themes under this issue as shown in figure 6.17.

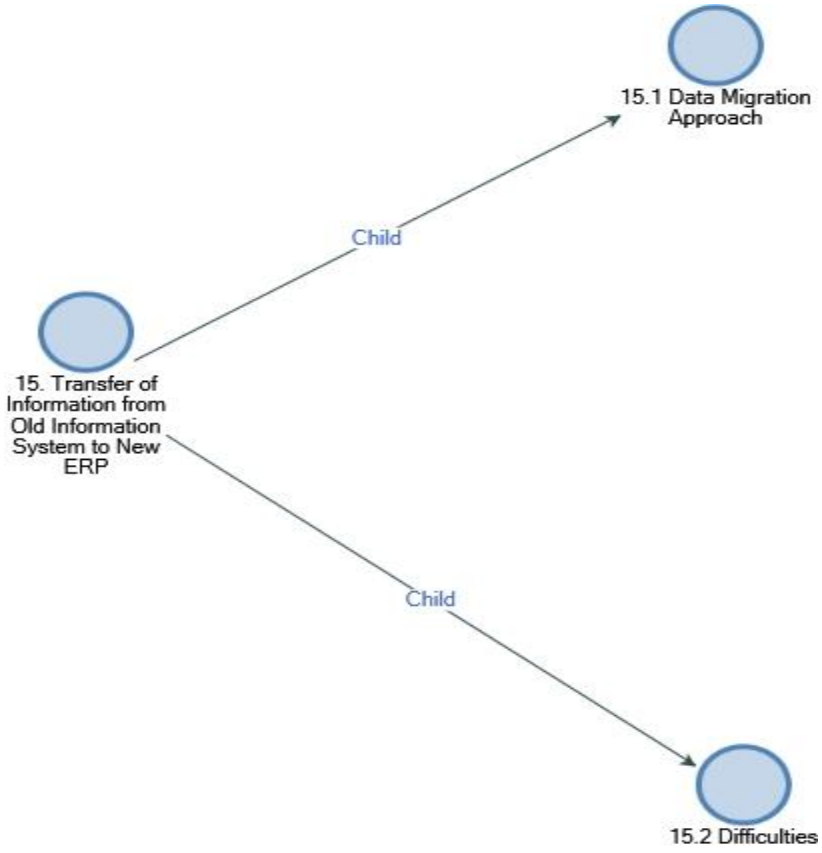

Figure 6. 17 Transfer of Information from old information system to new ERP system Sub-themes

❖ **Data Migration Approach**

The transfer of data and information from one system to another system is a technical task which requires special skills and expertise. Respondents were of the view that the transfer of can affect the success of the implementation because any mistake when transferring the old data to the new system can have a long lasting effect on the achievement of goals and targets. The analysis of the views of the technical staff revealed that a data migration approach was adopted by the management for transferring information to the ERP system. In the words of TL02,

“By developing a Strategy, the IT Department and our ERP vendor handled the data migration project. The project required participation from the entire university. Outline a plan and articulate it throughout the university, assigning roles, delegating responsibilities, and empowering decision-makers”.

In the words of TL01,

"Transfer of information from the old system to new ERP system was the most time-consuming task of the implementation activities. A well-defined data migration approach was adopted which ensured the meeting of the timeline, avoidance of costly budget overruns, and going live with clean and meaningful data".

❖ **Difficulties**

Participants were of the view that the organisation had faced some problems in the process of transferring information from the old information system to Oracle. Some of the important difficulties identified by the participants were customization, time shortage, and little understanding of cross functional business processes.

“One of the issues that is usually misinterpreted about the ERP system is that they involve wide customization. Typically, when a university makes a purchase of such a system, there is much to be done in order to have a final stable system.” - TL03

“Because of a shortage of time and coupled with the aspect of technical staff being undervalued, misunderstandings resulted in problems with cross-functional business processes.” - TL04 and TL05

6.6 Evaluation of ERP System Performance

This section of the analysis was specifically designed around the fourth research question of the study, which was, how can the success or failure of ERP systems implementation in HEIs be measured? Evaluation of a system can be done by comparing its performance with the pre-defined aims and objectives. Top management and technical staff were interviewed to obtain their views on the evaluation and assessment methods used. The interview questions were the pre-defined themes and the responses from the questions were coded as sub-themes for the purpose of analysis and interpretation. The themes were: methods of evaluation, performance, productivity, and recommendations to bring improvements in the system. The themes and sub-themes for the evaluation of the ERP system are shown in Table 6.5.

Table 6. 5 Evaluation themes and sub-themes

Themes	Sub-Themes
Instruments/Methods for measuring ERP outcomes	• Improvement in business performance • Targets • Time Frame • Stakeholders • Tangible Benefits
Stakeholders	• Definition • Stakeholder's Satisfaction
ERP Performance Evaluation	• Success • In-Between with Difficulties
Productivity	• Effect of ERP on Productivity • Deficiencies
Improvement in ERP System & Future Expectations	• Security • Connectivity • Need Assessment

	• IT Staff Recruitment

6.6.1 Measuring ERP outcomes

This section of the analysis was specifically designed around the first primary research question of the study, which was, how can the success or failure of ERP systems implementation in HEIs be measured?

Evaluation of a system can be done by comparing its performance with the pre-defined aims and objectives. Top management and technical staff were interviewed to obtain their views on the evaluation and assessment methods used. The interview questions were the pre-defined themes and the responses from the questions were coded as sub-themes for analysis and interpretation. Evaluation of the ERP system by top management and technical staff is a helpful in measuring the success or failure of implementation. Participants were asked about their knowledge of instruments adopted by the management for the measurement of the ERP system outcomes. Coding of the responses revealed that participants indicated improvement in business performance, achievement of targets, time frame, stakeholders and tangible benefits.

Presentation of these emerging sub themes in shown in Figure 6.18.

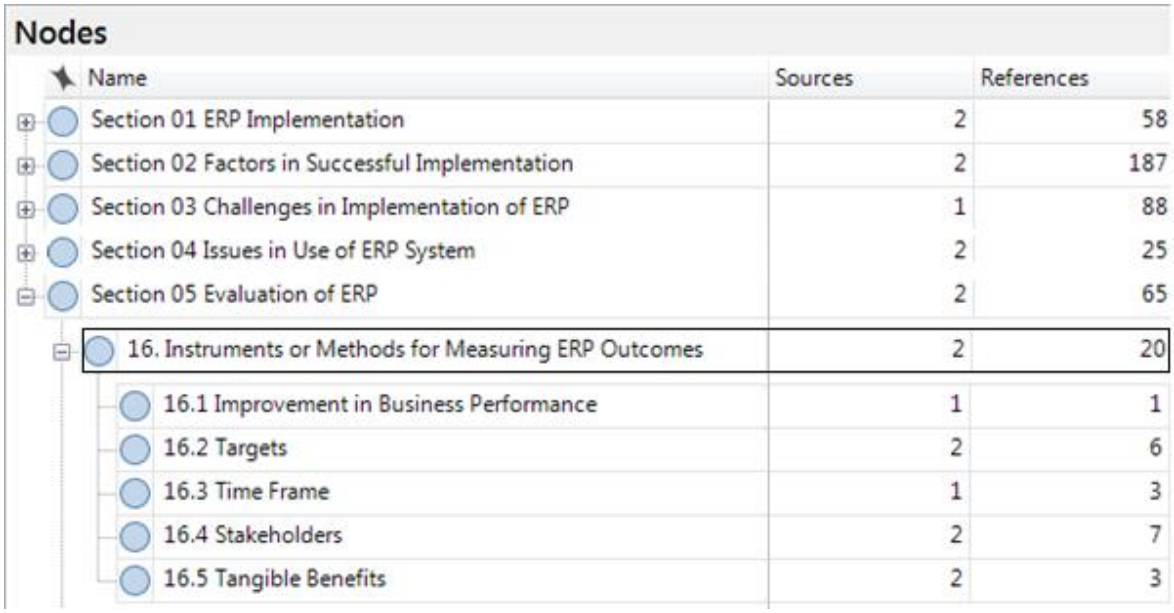

Figure 6. 18 Instruments/Methods for measuring ERP outcomes sub-themes are presented through NVivo output

❖ **Improvement in Organisational Processes**

The ERP system was implemented to improve the overall performance of the HEI and adopt the best international practices. This pre-defined objective for the ERP system implementation can also serve as an instrument to measure the outcomes of this system to make comparisons for its success and effectiveness. In the words of TL04 and TL05

"The best method for the measurement of ERP outcomes can be the assessment of pre-defined objective of improved business performance due to ERP system."

❖ **Targets**

Analysis of the responses indicated that one of the methods for the measurement of ERP success was the achievement of pre-defined targets set by top management. Therefore, the ERP system can be evaluated against these intended goals and targets. In the words of TM01 and TM02,

"One of the instruments for the measurement of ERP success is the evaluation of achievement of targets and goals of the university".

❖ **Time Frame**

Time management and achievement of desired goals is the best scenario which can be a useful tool in the evaluation of any new system in any organisation. Achievement of goals within the set time frame was identified as one of the evaluation instruments by some of the participants. As per TL02,

"Time is needed to amend processes affected by the ERP system; therefore while assessing and measuring the success of ERP system this factor should not be ignored".

❖ **Stakeholders**

All of the participants identified the stakeholders as the management of the university, staff members, and students. These stakeholders are also the users of ERP system; therefore, the success of the system can be measured through the satisfaction level of these stakeholders. As identified by the TL04, TL05, and TL01

"The satisfaction of end users can give a better view about the success of ERP system because a successfully implemented system will generate satisfied users".

"The measurement used in HEI_II *for the ERP system must meet the user view point" TL02.*

❖ **(Measurable) Benefits**

Some of the respondents were of the view that if a system is providing measurable benefits then it means the system is successfully implemented. In the words of TL03,

"Not all tangible benefits are readily measurable but ERP system can give some tangible benefits e.g. Providence of improved information to the employees for their job responsibilities".

"This benefit will help the employees in making fewer errors and will improve the communication". TL03

Some strategic benefits were also identified by one of the participants as a tool for the measurement of success of ERP system. According to TM06,

"ERP systems come with excellent reports and dashboards that can be very useful to management, in particular, better understanding the operations and managing things with more knowledge. It enhances decision-making ability".

6.6.2 Stakeholders Assessment

While evaluating the success of ERP system, one important theme to be discussed was the main stakeholders for the ERP system and the satisfaction gained from the ERP system by these stakeholders. The emerging sub-themes under the theme of stakeholders are shown in Figure 6.19.

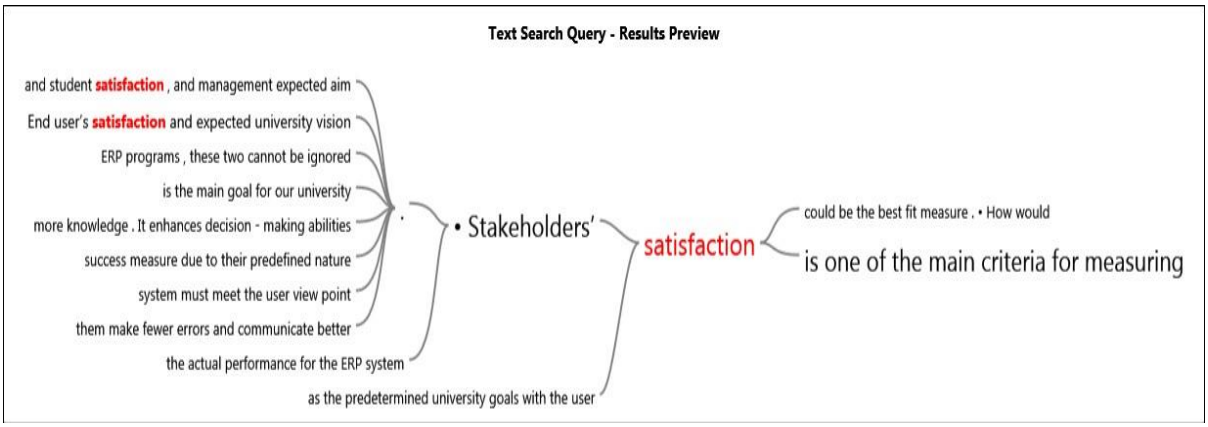

Figure 6. 19 Sub-themes under the stakeholders

❖ **Definition**

The technical staff participants were questioned regarding their perception regarding the meaning of stakeholders in the HEI. The majority of the participants were of the view that all of the users of the ERP system are the stakeholders. In the words of TL01 and TL02,

"All the users of the ERP system (Staff, Students, and Alumni) or the stakeholders of ERP system".

Two of the participants identified technical staff as the real stakeholders.

"Technical staff of the university is the basic stakeholder for the evaluation of ERP system because the effect of ERP system is most dominant on the staff".

❖ **Stakeholder's Satisfaction**

Views and opinions were gathered from the participants regarding the suitability of stakeholder satisfaction as a measure of the success of the ERP implementation in the HEI. All of the top management and Technical staff interviewed supported the use of stakeholder's satisfaction as the measurement tool for evaluation of ERP implementation. As in the words of TL02, TL04, TL05, TM03, TM04, and TM05,

"Stakeholder's satisfaction for the measurement of ERP implementation in our organisation is one of the best and most common measurements because they are the main users of ERP system".

Some participants thought that it was important that the stakeholders were specifically identified but that other measures should also be adopted to evaluate the actual performance of the ERP system. According to TL01,

"We need to use more than one measure to know the actual performance of ERP".

"The measure of stakeholder's satisfaction should be more specific by identifying who exactly are the main stakeholders for an educational institution".

6.6.3 ERP Performance Evaluation

All the interview participants were questioned to evaluate the success or failure of the ERP system being implemented in their HEI. The coding of the responses of participants showed the emerging sub-themes for the evaluation of ERP performance to be as shown in Figure 6.20.

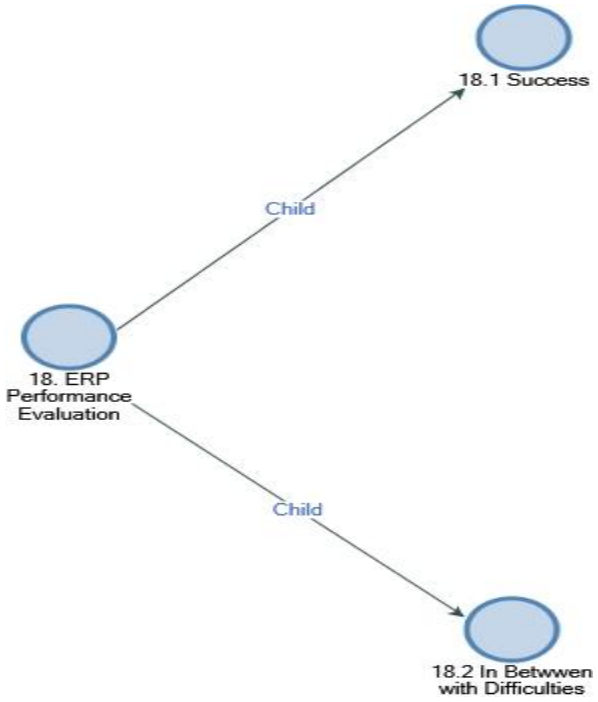

Figure 6. 20 Sub-themes under the evaluation of ERP system

In the theme of ERP performance evaluation, two sub-themes were identified, which were success and in-between performance of the ERP system. Responses from top management and technical staff were analyzed for each of the sub themes for the purpose of evaluating the ERP system. The NVivo 11 representation of analysis indicated that the percentage of technical staff who considered the Oracle ERP system implementation to be a success was higher than top management. Hence it can be said, that according to the technical staff, Oracle ERP was successfully implemented as shown in the Figure 6.21.

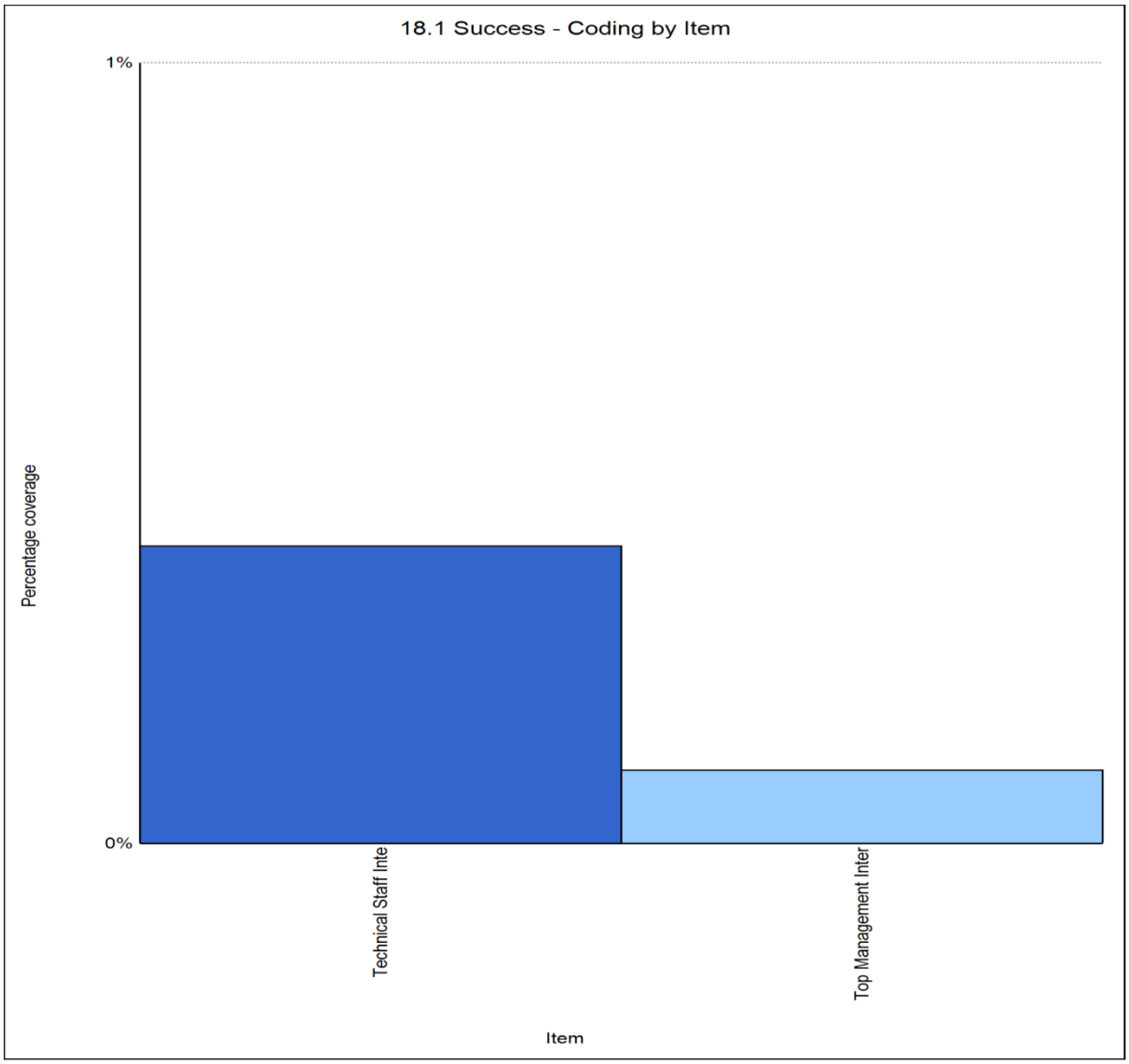

Figure 6. 21 Evaluation from technical level staff of HEI_II ERP system

As per the words of TM05,

"The performance of ERP system in our university is quite satisfactory".

Similarly, TL01 narrated,

"Despite all of the challenges which we have faced I believe that ERP has improved the overall performance of the university".

"It's running perfectly" TL02.

In view of TL04 and TL05,

"Many of the end users reported that our current ERP is not easy to use so we are looking for better improvements and enhancements".

6.6.4 Effectiveness and Efficiency of Organisational Process

One of the basic objectives of the implementation of the ERP system was the improvement of productivity therefore this can be used as a means of evaluation. An improvement in the productivity of the organisation will mean that the ERP system was a success. The sub themes that emerged for the measurement of productivity are in Figure 6.22.

Figure 6. 22 Sub-themes for measurement of productivity

❖ **Effect of ERP on Productivity**

Participants from top management were interviewed for the evaluation of the effecs of the ERP system on productivity. Analysis of the responses of the participants revealed that almost all of the participants were of the view that the Oracls ERP system improved the overall productivity of the institution. Some of the important benefits were highlighted by the participants in respect of enhanced productivity. For example, according to TM03

“Enabled strategic decision making for improvement of performance across institution, evaluated success using real-time fundraising reports, and posted student billing and cash receipts to the general ledger with wizard-assisted interface”

Similarly, TM05 identified the benefits of utility and easy access in these words:

“Navigate quickly and easily using intuitive dashboards and reports against benchmark goals using real time data.”

“Better internal information flow, flexibility, more integrated business processes, and collaborations with suppliers.”

The benefit of communication and collaboration were highlighted by other participants because the real time information from the ERP system has helped management to understand situations quickly and speeded up decision making. According to TM01 and TM02,

"Businesses rely on tight communication and collaborations within the university departments, suppliers, and students. Application of ERP system has empowered users through the collaboration and thus has increased productivity."

❖ **Deficiencies**

The top management participants were of the view that there were still some missing factors which needed attention to enhance to the productivity of the organisation. These missing elements can be summarized as the integration of database. In the words of TM06,

“An integrated and centralized database that supports diverse business functions and incorporates functions for different business segments in the same system is a recipe for increased productivity.”

6.6.5 Improvements in ERP System and Future Expectations

While evaluating the success of the ERP system, participants from top management identified some suggestions and recommendations for the improvement of the ERP system in future. Basically, these suggestions are the missing links which are supposed to be incorporated in the ERP system to make it more effective and more productive to achieve the overall growth,

development, and performance of the HEI. Emerging sub themes from the coding of responses in respect of suggestions and recommendation are shown in Figure 6.23.

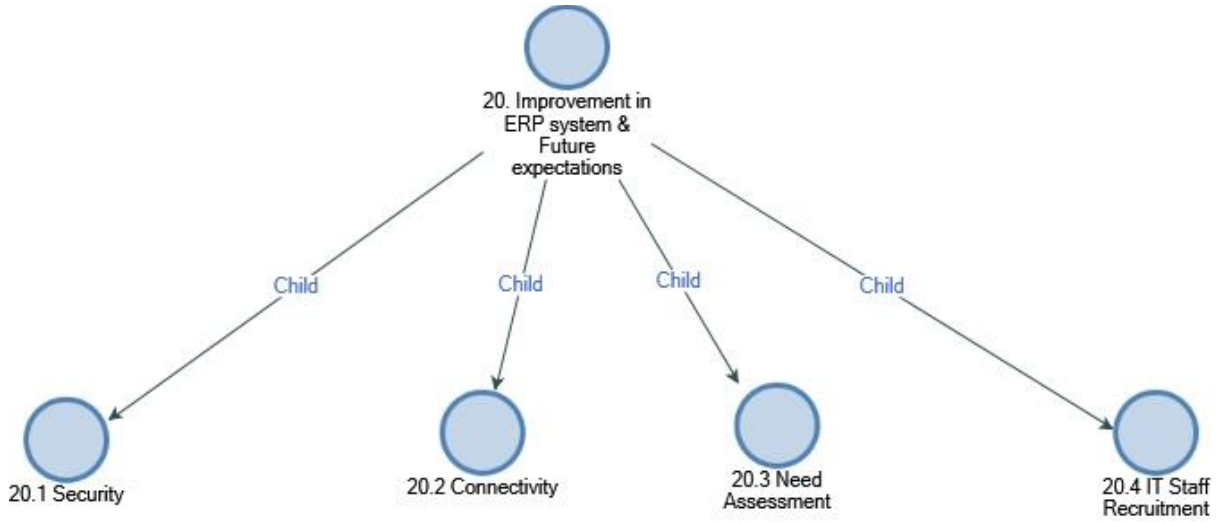

Figure 6. 23 Emerging sub themes from the coding of responses in respect of suggestions and recommendation

❖ **Analysis of suggestions and recommendations by NVivo matrix coding chart**

NVivo 11 matrix coding chart query test has been used to analyze the important suggestions and recommendations made by the top management participants to improve the ERP system. These suggestions and recommendations were identified as the emerging sub themes for the purpose of analysis. The important sub themes were security, connectivity, need assessment and IT staff recruitment. The coding of the responses revealed that most of the participants identified improved connectivity the most important which was followed by need assessment, then IT staff recruitment and finally enhancement and improvement of security issues for the improved performance as shown in figure 6.24.

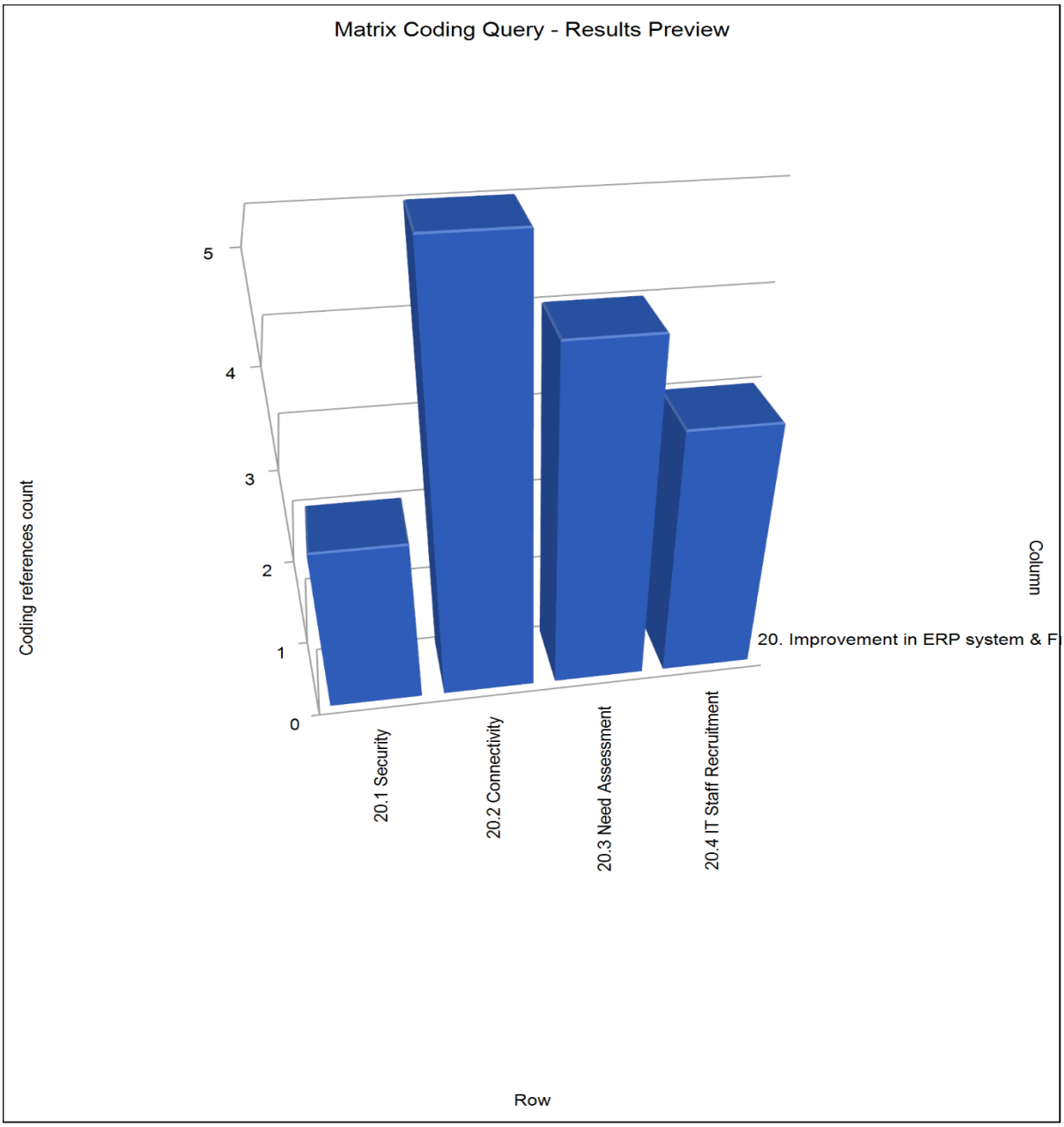

Figure 6. 24 important sub themes are security, connectivity, need assessment and IT staff recruitment.

The security issue was highlighted as per the words of TM03,

"More secure ERP system; security issues, thefts and hackers get access to identities and corporately sensitive data".

On connectivity, in the words of TM04,

"There is a need to be connected with all university partners, mobile application ERP".

“Create automated email system through ERP to connect lectures with students (especially if the internet is down)". TM04.

The importance of a need assessment was highlighted by TM04 in these words,

"Carefully writing the requirements for the system before the adoption stage is needed".

6.7 Chapter Summary

The Oracle ERP system was implemented in this HEI using a phased roll out approach to improve the business performance, achieve integration and enhance utility for the academic institution. The management of the university used change management and the provision of training to reduce the resistance of staff to the new system, but at the time of the study, this issue was still unresolved. The key success factors for the system implementation identified by the top level management and technical staff interviewed were classified under four heads which were technical, organisational, project and project support system. The provision of qualified IT staff support for in-house maintenance of the ERP system was considered to be the most influential factor of the post implementation phase.

There have been some problems in use and maintenance of the system which require special attention from the management of university to make the ERP system fully successful. These problems are resistance by staff members, high maintenance costs, integration issues, poor communication within departments and compatibility issues due to the lack of training and understanding of the staff involved in the implementation.

The majority of the technical staff interviewed assessed the implementation as successful whereas top management were of the view that the performance of oracle still has room for improvement. Some of the suggestions and recommendations provided by the participants for the improvement of the system were enhancement in security protocols, improved need assessment strategies, recruitment of skilled IT staff and enhanced connectivity.

CHAPTER 7 THIRD CASE STUDY (HEI_III)

7.0 Chapter Overview

In this chapter the qualitative analysis of the selected case study three is presented to interpret the empirical findings and results for further conclusions. It is to be noted that same structure has been adopted for the selected three case studies, to make the analysis findings comparable and reliable. The research objectives of the study were focused on the identification of most influential key success factors for the successful implementation of ERP system in a higher education institution. For the achievement of research objectives, the research questions were developed in accordance with the basic aims of the study. The data has been collected through the semi-structured interview protocol which was administered on the purposively selected sample participants from the each case study. Eleven participants were approached and interviewed after their consent and willingness for participation in the study.

In case study three, participants from top management and technical level were selected to be analysed for their views and opinions on the success of ERP implementation in HEI_III. Similar hierarchal level has been followed in all three case studies. The data collected from the participants is analysed through qualitative content analysis technique with the support of NVivo software. In the present chapter an overall introduction of the selected higher educational institution is provided to understand the current position and policy statement. In the analysis of HEI_III, section wise empirical findings are presented with the support of NVivo and quotations from the participants. Key factors are identified, and the most influential key factors for this case study are evaluated by mapping the factors along the ERP implementation phases and stages. Additionally, the suggestions and recommendations provided by the participants of case study three are presented and analysed to bring improvements in the prevailing ERP system.

7.1 Introduction to (HEI_III)

HEI_III is a government university which is located in Mushaqar (Madaba - Jordan). A memorandum of understanding was signed between the Ministry of Higher Education and Scientific Research and the Federal Ministry of Education and Research of the Federal Republic of Germany in 2005 as per which the university was established. The founding committee started cooperation with Ministry of Higher Education and the Scientific Research in 2004. The project of HEI_III falls under the category of "German Study Programmes Abroad" and is sponsored by the Federal Ministry of Education and Research (BMBF) and the German Academic Exchange Service (DAAD).

German applied sciences model has been adopted by the university, which focuses on the practice and transfer of knowledge. 20 programs are being offered to around 5000 students by the university (HEI_III, 2017). HEI_III gives much importance to the research and research led teaching practices to impart the research facilities of the highest quality. A significant growth has been witnessed in size and stature of the university over the past few years, and the university has made cooperative and collaborative agreements with many Arab universities as well as the European, North American and Asian universities. HEI_III is following the aim of preparing highly skilled graduates for the requirements of market and motivation to play their positive part in the socio-economic development of the country and region (HEI_III, 2017).

HEI_III signed a cooperation agreement with the Integrated Technology Group (ITG) in 2006 to implement a solution for educational and technological needs. ITG and the university management agreed to make an integration plan for e-learning and ERP for academic and administrative purposes. E-learning was agreed to be done through eduwave which is an e-learning platform by ITG and the ERP solution was Wave ERP (HEI_III, 2017).

EduWave by the ITG is a web based e-learning platform which provides the integrated solutions for learning contents and student management. With the support of ITG's ERP solution WaveERP, a comprehensive solution for the academic and administrative needs was provided to HEI_III. EduWave is an award winning solution by UN World Summit, and it has already been deployed in Kingdom of Bahrain, United States, and Oman (HEI_III, 2017).

In HEI_III SAP enterprise application software has been implemented, which is the biggest ERP system in the world and is German software. SAP is considered as the most efficient enterprise solution for companies of all sizes. SAP is the market leader because it empowers the organisations and people to work together through the integration and insight of the business activities. SAP is serving more than 258,000 customers all around the world by enhancing their profitability through operations, adaptations, and sustainable growth parameters.

In order to bring the academics and industry closer together, the HEI_III has signed a Memorandum of Understanding (MoU) with SAP Training and Development Institute FZCO, through which a “Dual Study Program” was initiated for the students of HEI_III. This program is aimed to add the industry related learning and practical work time to enhance the experience of the students.

According to the MoU, the two sides will make efforts to provide the student's opportunities of theoretical knowledge of SAP as well as the workplace experience to make them qualified and experienced for the effective use of SAP in their studies and other administrative operations within the university and outside the educational setup.

7.2 ERP Implementation in HEI_III

As it has been mentioned that the analysis has been classified into five main sections from which section one address the information about the prevailing ERP system in HEI_III. Participants of the study were inquired about their views and opinions regarding which ERP system has been implemented in their organisation, at which phase it is as present, what were the objectives for the adoption of this specific system, what strategies are being used and who are the users of this system. This first section of the analysis is addressing the first research question. Themes have been identified in accordance with the research questions and questions from the interview protocol. Qualitative participants responded to the interview questions which gave the basis for emerging sub themes for the purpose of analysis and interpretation of findings. These emerging sub themes are basically responses of the participants and are coded manually under their respective themes. As per the wordings of NVivo software, themes have been named as "parent

nodes" and sub themes are referred as "child nodes". Themes and emerging sub themes have been presented in table 7.1 for this section.

Table 7. 1 Parent nodes and child nodes in NVivo software (themes and sub-themes)

Themes (Parent Nodes)	Sub-Themes (Child Nodes)
ERP System Used	• System Information • Objectives • Users
Reasons for ERP Implementation	• Integration • Improvement in Business Performance • E-Learning Facilities
Strategy to Adopt ERP System	• Approach (Big-Bang Approach)
Management Strategy for Resistance	• Training Incentives for Users • Unresolved Issues
Training for ERP System	• Basics of Training • Response of Staff

7.2.1 ERP System Used

Participants from the technical level were inquired about their knowledge about the prevailing ERP system which is being used in HEI_III. It has been stated by the participants that HEI_III and Integrated Technology Group had signed an agreement for cooperation to implement a comprehensive educational and technological solution for the university in 2006. The emerging sub theme under the theme of prevailing ERP system being used in HEI (HEI_III) is presented in NVivo figure 7.1.

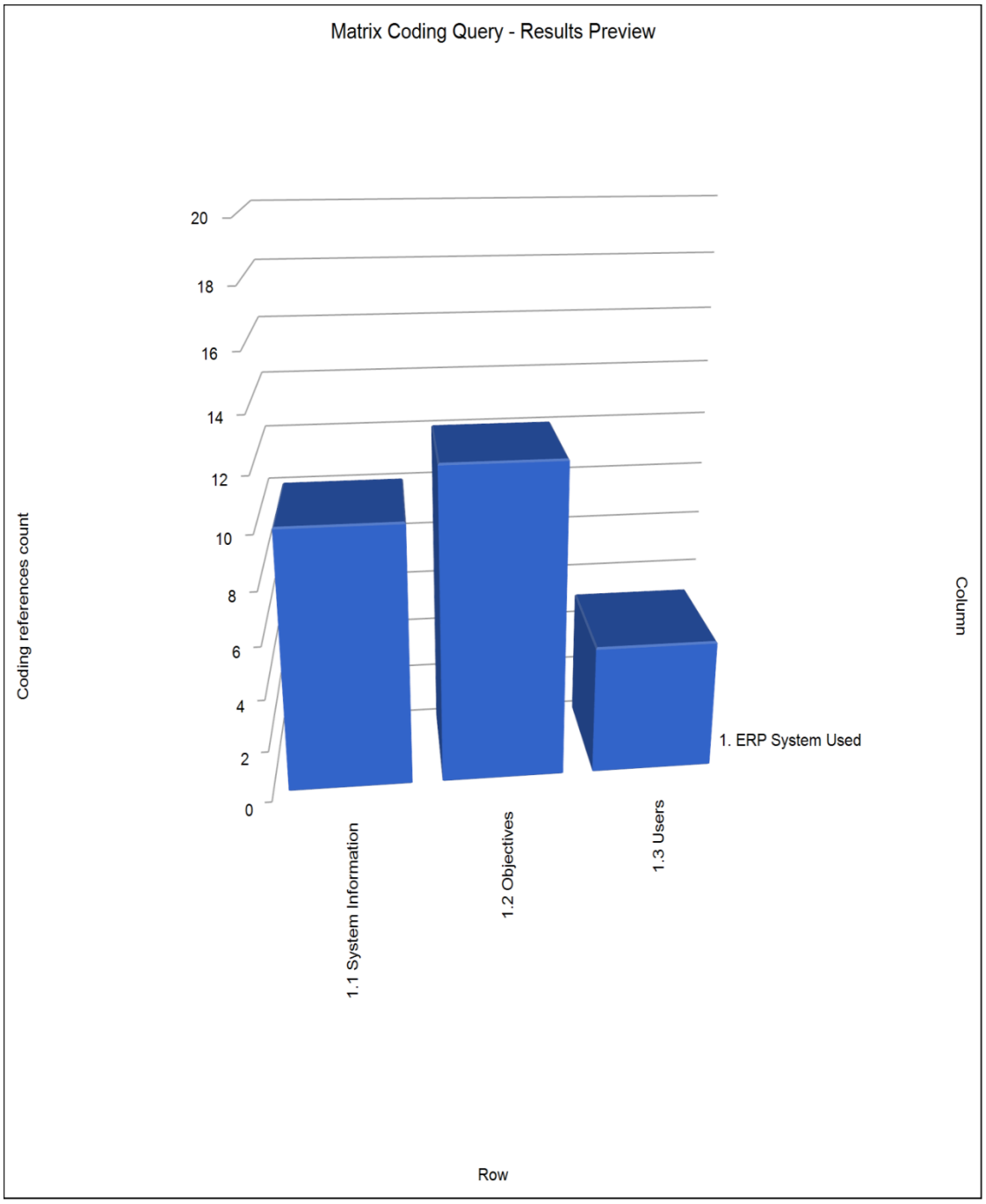

Figure 7. 1 ERP System Used and sub-themes

As per the responses of the participants (Top management and technical level), the emerging sub themes are discussed as follows.

❖ **System Information**

Participants from the technical level gave the basic specification for prevailing ERP system in HEI_III and all of the participants provided the information that SAP has been implemented in university and currently it is in post implementation phase. In the words of TL01,

“The name of the ERP system in our university is SAP, which is the biggest ERP system in the world and it’s a German software”

It has been mentioned earlier that HEI_III and Integrated Technology Group (ITG) has signed the cooperation agreement in 2006 through which they implemented SAP in (HEI_III) in the same year so the participants also gave the information that SAP is in its post implementation phase. As per TL04

"ERP system in our university is at post implementation phase because it's been a long time since 2006 when started the implementation of SAP".

❖ **Objectives**

Objectives were the overall general benefits of ERP system mentioned by top management whereas reasons are the specific ones that why have this ERP been adopted for their HEI. Participants of the top management provided their perceptions about the general aims and objectives of the ERP system as per their knowledge and experience. Strategic decisions of the organization are mainly the responsibility of top management so the top level management must be fully aware of pre-defined aims and objectives of a system or software for their decision making. These aims and objectives are the basic targets which are supposed to be achieved through the adoption of the system; hence the evaluation of ERP system depends upon the identification and achievement of these objectives as sows in the figure 7.2. One of the objectives identified by the participant was the alignment of the project with the universities policy to integrate the academic and operational activities. As per the words of TM01,

“The university has the policy to integrate academic and operational activities with the help of technology and utilization of modern infrastructure. The implementation of ERP system was stepped towards this goal which allowed the students, faculty and staff members an effective and efficient approach for their daily operations.”

Similarly in the words of TM03,

"It is better to develop new, more efficient processes that fully leverage the technology investment and make an integrated system which can monitor academic learning and teaching along with managing daily activities".

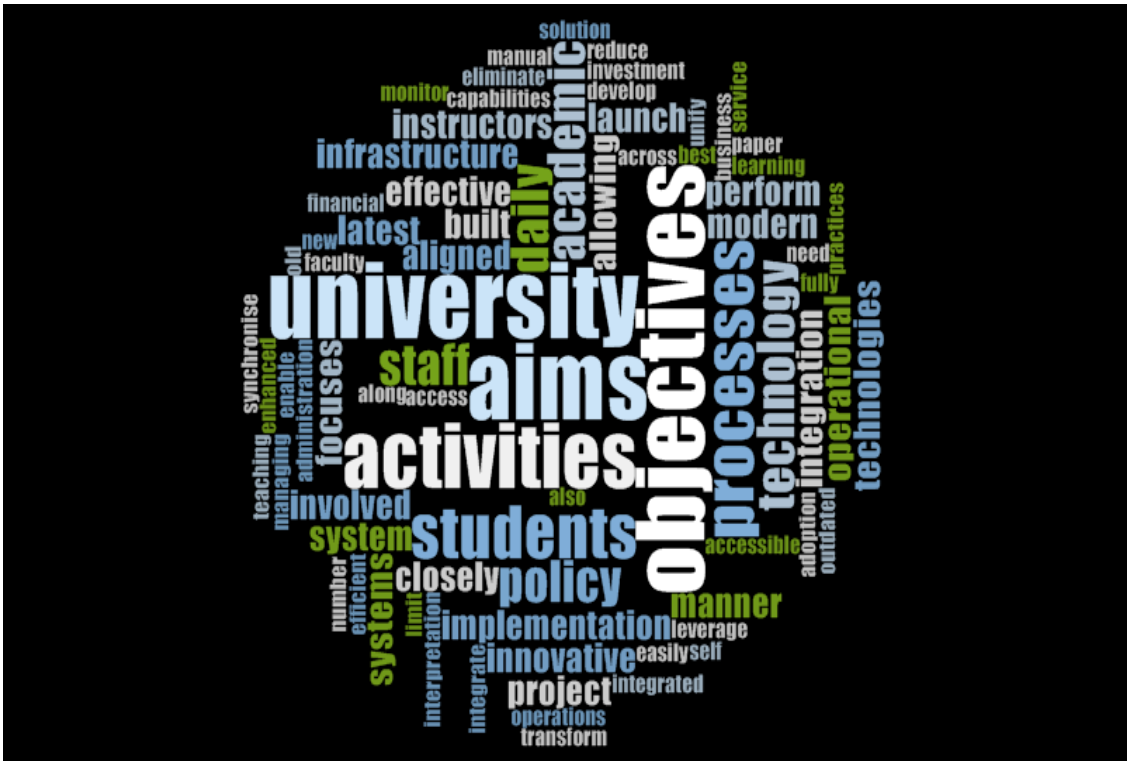

Figure 7. 2 Sub themes for HEI_III objectives

❖ **Users**

In the process of implementing a software system in an organisation, it is important to identify the users who are using the software in their activities and operations. Technical level participants identified that all the staff members of the university and students of the university are the main users of the system through various apps and features of the ERP system for their administrative as well as academic operations. In the words of TL03, TL04, and TL05,

"The users of the ERP system will be staff members of the university and students of the University to perform their administrative and academic functions"

7.2.2 Reasons for ERP Implementation

Top management and technical level participants were inquired about their knowledge about those important reasons due to which ERP system has been implemented in HEI_III. The questions in the interview protocol have this pre-defined theme of reasons for ERP implementation and the responses provided by the participants were the emerging sub themes which can be stated as the reasons for the adoption of ERP system. Three basic reasons emerged in the responses of the participants. This theme of reasons and emerging sub themes have been presented in NVivo Figure 7.3.

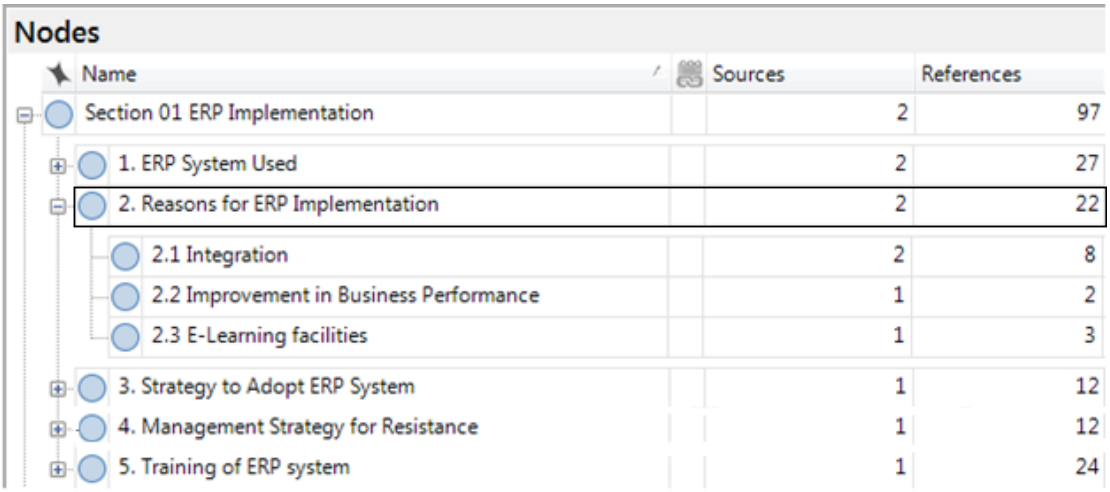

Figure 7. 3 Reasons for ERP Implementation sub-themes which are represented by the NVivo screenshot

The three main reasons identified by the participants of the study are integration, improvement in business performance and E-learning facilities to the students. These sub themes were addressed by top management as well as by the technical level participants. Integration has been emphasized in the words of TM01,

"The university was involved in the implementation of ERP system which automated and integrated academic and administrative activities such as human resource management, inventory control and planning, finances, student's information and management and e-learning facilities."

Similarly, improvement in business performance has been highlighted by TM03 and TM04 in the words that,

"The basic reason for the introduction of ERP project in our university is to improve the performance of the business and compete internationally at different forums".

E-Learning is one of the important reason stated by different participants, for instance as per TL04 and TL05,

"Provide a web based end to end e-learning platform for teaching and learning to faculty and students. E-Learning and E-content management is an important feature to provide flexible and customized solutions to educational bodies for their learning processes".

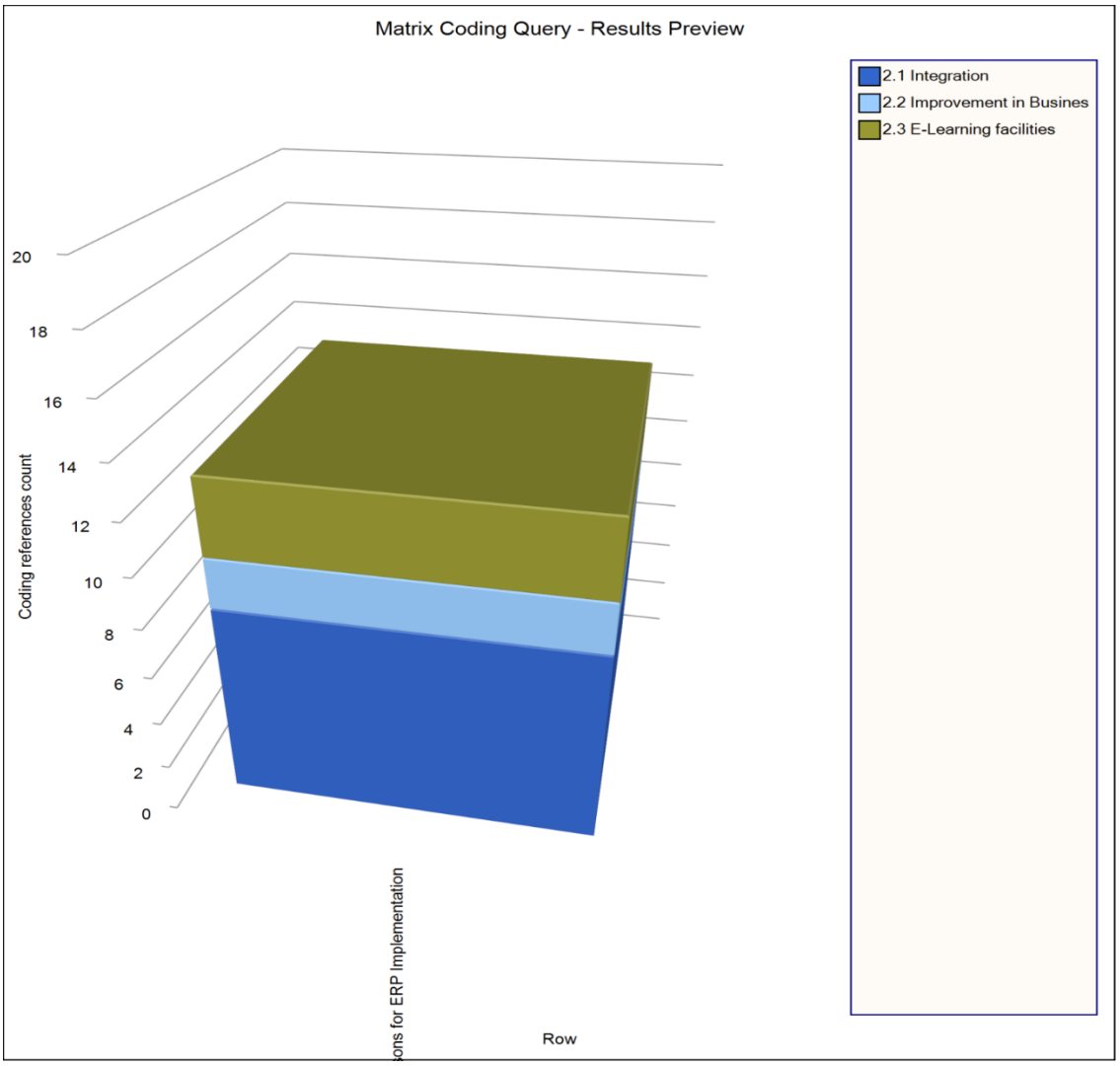

Figure 7. 4 Reasons for ERP Implementation sub-themes which are represented by the NVivo

7.2.3 Strategy to Adopt ERP System

In order to introduce and adopt any new system in an organisation, there is a need to develop a strategy through which successful implementation of the new system can be achieved. Top management participants were questioned about the strategy which was adopted to implement the ERP system in HEI_III. Responses of the participants gave birth to the emerging sub themes which are given as under Figure 7.5.

Figure 7. 5 Strategy to Adopt ERP System represented by the NVivo

❖ **Approach (Big-Bang Approach)**

Top management participants gave a unanimous response by stating that big band approach is being adopted to implement the ERP system in HEI_III. In the words of TM02,

"In order to integrate the system and implement SAP, we adopted big bang approach".

Big bang approach facilitated the implementation of ERP in all business units at all locations at the same time. As in the words of TM03,

"*Big bang approach is a straight forward approach which followed the implementation of all modules of ERP system in all departments of the university at the same time".*

7.2.4 Change Management Strategy

As mentioned earlier, HEI_III implemented the SAP ERP system in 2006. Before the implementation of SAP ERP system, the staff of the university was working on old information system with which they were familiar and they had experience in its use. The introduction of new

system showed signs of resistance to the staff members for the use of new systems. In order to tackle the issue of resistance management of the university had to adopt a strategy to encourage the staff members for the use of the new system. Responses by the top management participants identified the following strategies which were coded as emerging sub themes for NVivo software figure (7-6).

This is the sub-theme which is addressing those incentives which are offered to staff members to tackle the issue of resistance. While the theme of training is for that basic first time training which was provided to staff members at the start of implementation of ERP system.

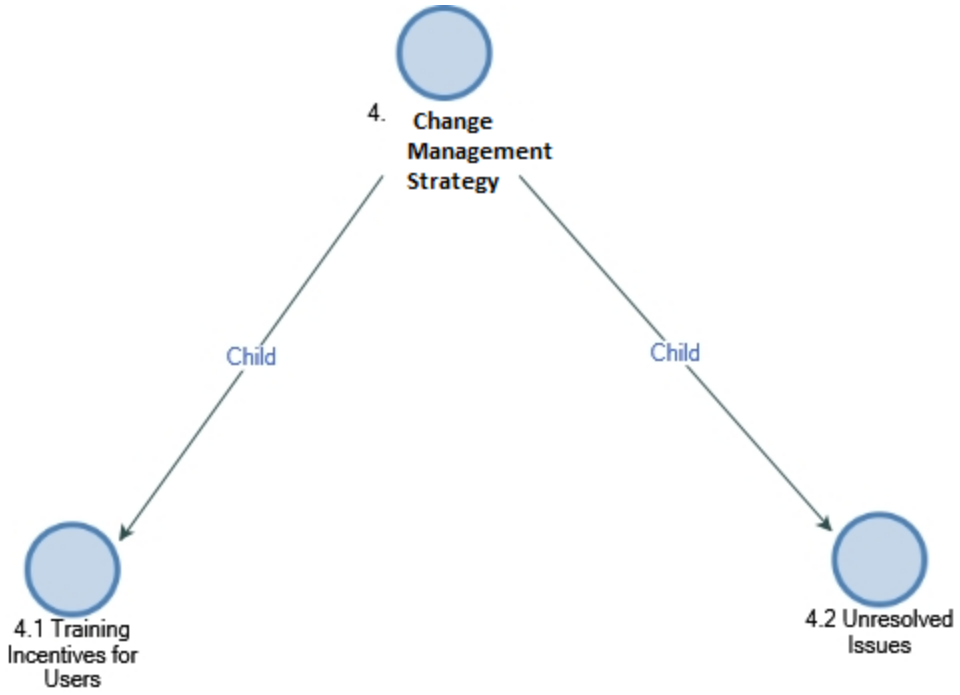

Figure 7. 6 Change Management Strategy applied

❖ **Training Incentives for Users**

One of the most important strategies highlighted by the responses of top management was the training incentives for users. According to this strategy, different incentives were being offered to the users (Staff and Students) for further training and adoption of new systems for their administrative and academic purposes. As in the words of TM02,

"Management has arranged training and educative sessions for the users of ERP system, especially for the students. The university has also signed an MOU with SAP training and development institute under which a Dual Study Programme will be offered to students so that they can gain theoretical knowledge and work place experience before the completion of their studies".

❖ **Un-Resolved Issue**

Analysis of the responses by the top management indicated that some of the participants were of the view that the issue of resistance by the users of ERP system is still unresolved within the university which is making some problems for the success of ERP system as well. Participants indicated that the staff members are still not willing to change to the new system regardless of training and incentives provided to them. In the words of TM05,

"The resistance matter has not been tackled completely until now as the staff is still showing signs of resistance by not accepting the new ERP system".

Similarly, TM03 indicated

"The issue of resistance has not been solved yet"

7.2.5 Training of ERP system

Some of the questions relating to the training provided to the staff members in regard to new ERP system and impact of that training on staff members were included in the interview protocol of top management level. As mentioned earlier, SAP was adopted in 2006, which was a new system for staff members of HEI_III and for every new system basic education and training is required to use the new system.

This was the mandatory training at the start of ERP system and response of staff at that time. This was not meant to tackle the issue of resistance, but to train the staff first time for the introduction and use of ERP. Therefore the training courses were provided to staff members and the responses of top management relating to the training and its impact on staff members were the emerging sub themes under coding of NVivo as figure 7.7.

Figure 7. 7 Training of ERP system represented by the NVivo

Basics of Training

Top management participants gave the similar information for the basics of training which has been provided to the users of new ERP system. It was highlighted in the responses that training of one month was imparted to the users of SAP for their understanding and familiarization to the new system and this training was provided by the Integrated Technology Group (ITG), who is the vendor of SAP for HEI_III. As narrated by TM 04 and TM06,

"Training of one month was given to the staff members of the University to the use of new ERP system SAP".

- **Response of the Staff**

As per the responses of the participants, the response of staff towards the training course was not as per the expectations of management. The response of the staff towards the training or use of new system indicated the existence of resistance and no acceptance by the staff for the new system. According to TM02,

"Staff was not mentally ready for the training".

The SAP is a very complicated and technical system which is not easy to be understood by users without intensive and appropriate training for its use. Analysis of the responses indicated that the staff members showed the reluctance, no motivation, and unpreparedness for the training of complex system like SAP. As in the words of TM04,

"The staff seemed reluctant and less responsive in training due to their own personal preferences and also due to their busy schedules".

One of the participants gave the opinion that

"Staff members were not mentally prepared to change their perceptions from old system to new one that is why they didn't pay much attention to the training courses".TM01

In summary , it was analysed that SAP 2006 is the prevailing ERP system in HEI_III which is at post implementation phase. According to the views of participants, the aims and objectives of ERP project were the development of new efficient processes that fully leveraged the technological investment and an integrated system which can monitor academic learning and teaching along with the management of daily activities. Three most important reasons highlighted by the participants for the implementation of SAP in HEI_III were the introduction of integration for academic and administrative activities, improvement of overall business performance to compete internationally and provision of e-learning facilities to the students and teachers for improved academic results. For the implementation of SAP, Big bang approach has been adopted, to tackle the issue of resistance by staff training incentives are being introduced but this issue is still unresolved; because one month intensive training was given to the staff members at the beginning of implementation but the staff members didn't respond well to the training due to their personal preferences and mentally un-preparedness.

7.3 Key Successful Factors for ERP Implementation

The second section of the analysis is addressing those factors which can influence the implementation of ERP system within an organisation. This section is derived in accordance with the transcripts and responses of semi structured interview protocol. Top management participants, as well as technical level participants, were inquired about their views and opinions regarding those factors which should be considered as important for the success of ERP system in HEI. Questions within the semi structured interview protocol addressing this section were related to the first research question of the study which was to identify those influential factors which can have an impact on the success of ERP system in HEI.

As per the responses of the participants (Top management and technical level), the heads of the identified factors were coded as themes under this section and the responses of participants

under each factor head were considered as the emerging sub-themes which are shown in table 7.2.

Table 7. 2 Factors in Successful ERP as parent nodes and child nodes in NVivo software

Themes (Parent Nodes)	Sub-Themes (Child Nodes)
Technical Factors	• IT Infrastructure • Information Quality • system Quality
Organisational Factors	• Change Management • Training and Education • Organisational Culture • Business Process Reengineering
Project Factors	• Project Management • Budget • Time • Right ERP
Project Support System Factors	• Top Management Commitment and Support • Qualified IT Staff • Vendor Relations

Detailed explanation and analysis of each theme and sub-theme are as under:

7.3.1 Technical Factors

Technical facilities and technical resources are considered as one of the most important factors for the implementation of any new system within an organisation. Participants identified the important technical factors which are coded as emerging sub themes in they are represented as figure 7.8.

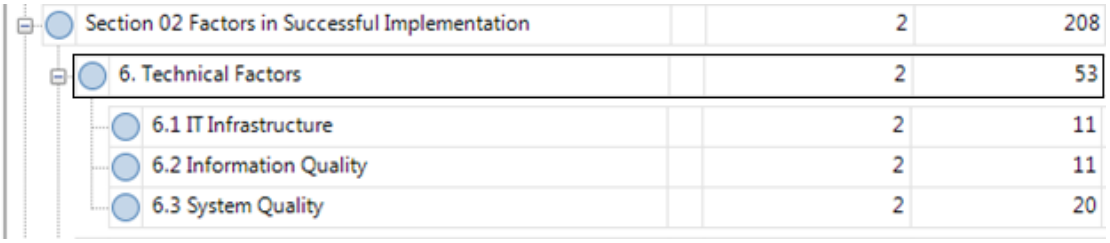

Figure 7. 8 sub-themes which are represented by the NVivo screenshot

❖ **I.T Infrastructure**

Analysis of the responses revealed that the university has been established in 2005 and ERP system had been implemented in 2006. So it was stated that the I.T infrastructure available in the university was updated and new. Availability of updated technical resources and their maximum utilization can ensure the smooth and successful implementation of a software system. Top level participants, as well as technical level participants, highlighted the need of IT infrastructure for the successful implementation of ERP system. As per TM01,

"IT infrastructure within an organisation plays an important role for the smooth implementation of ERP system or any other new system in any organisation".

According to the prioritization chart, the participants gave the medium priority to the IT infrastructure of HEI_III as an influential factor in the successful implementation of ERP system in university because, as per TL02

"As the university is new (Established in 2005), so the infrastructure is good in our university".

As per the prioritization chart, although IT infrastructure is an important factor, but in the scenario of HEI_III; IT infrastructure is not making issues and problems for the successful implementation of SAP within the organisation. In the words of TM03,

"No one can deny the importance of quality infrastructure and updated equipment for the implementation of software systems within an organisation".

Similarly, TL01,

"Although IT infrastructure should be ranked high in priority but for our university, we are not facing many issues regarding this factor for the success of SAP".

- **Information Quality**

The performance of an ERP system and quality of its outcomes is dependent upon the quality of information which was input into the system. All of the participants gave much importance to the quality of information as an important technical factor for the success of ERP. In the words of TM03 and TL04,

"If the good quality information is fed to ERP system then we can expect a good quality of output from the system".

Similarly, in the words of TM 05,

"Errors at the time of input of information to ERP system can adversely affect the results generated by the system and overall performance of the system".

The majority of the participants indicated that the quality of information in HEI_III for SAP is good and up to the standards of the SAP. In the words of TM06,

"Quality of information in our university is good and this factor should be given seven out of 10 on priority scale because this factor is not creating issues for the success of SAP".

❖ **System Quality**

Analysis of the responses indicated that the quality of the system which is being adopted in the organisation also plays an important role in the evaluation of the ERP system for the evaluation of pre-defined targets. As per the words of TM04,

"A poor quality ERP system cannot be expected to achieve the targets of the organisation. Analysis of the responses indicated that most of the participants were not satisfied with the technicalities and complexities of the ERP system SAP".

In the words of TL01,

"The SAP ERP system is very much complicated and it is not easy to use".

Similarly as per TM03,

"Although SAP is the biggest ERP system in the world, but it is a very much complex and complicated system".

The majority of the participants rank this factor very high on their priority list because the complication and complexity of the system are affecting the acceptability and use of the system by the users adversely. As per TM06,

"For the success of SAP in our organisation, I'll give nine out of ten to the quality of system because it is creating some issues".

Similarly as per TL05,

"This technical factor has a very high importance for the successful implementation of ERP system in our HEI".

7.3.2 Organisational Factors

It has been observed that some of the organisational factors can influence the performance of the organisation as well as the different system implemented within the organisation. These organisational factors can influence the individual performance of the organisation members and also the overall growth of the organisation within the organisational community. Analysis of the responses revealed that the participants highlighted some important factors under this head which are coded as emerging sub themes for the success of ERP system.

A detailed explanation of the sub themes and its relevance to the success of ERP system has been shown through the narrations by participants and NVivo analysis. Four important organisational factors were highlighted by the respondents and these factors were change management, training and education, organisational culture, and business process re-engineering. In order to implement a new system in an organisation, there is a need for a transition and up gradation of business processes and its operations which require effective and efficient management. This is considered as a change management policy or strategy adopted by the management to gradually introduces and inculcate that change within the structure of the organisation. In the words of TL01,

"In the process of change management, it was witnessed that the staff was not ready to use the technology".

Similarly in the words of TM05,

"Although, the management tried to make the transition through a proper channel but the staff of the university was not willing to participate in this transition".

Second important factor highlighted by the participants was training and education. Education and training are one of the important individual factors as well as influential organisational factors. Analyses of the responses have revealed that there is a lack of education and training for the use of ERP system. This deficiency has been affecting the successful implementation of SAP system for its optimum use by the staff members and by the students of the university. In the words of TM02,

"Training of the staff members is one of the most important organisational factors which can influence the success of the organisation and its performance".

As per T04,

"The staff members of the university lack the basic education and required training for the use of SAP ERP system".

According to TM06,

"The staff members didn't respond to the training of SAP as per the objective and expectation of management".

In the words of TL02,

"As the training and education of staff members is affecting the optimum use of ERP system, and it's causing non-acceptability and resistance by the users, therefore this factor should be ranked highly influential for its importance in HEI_III*"*

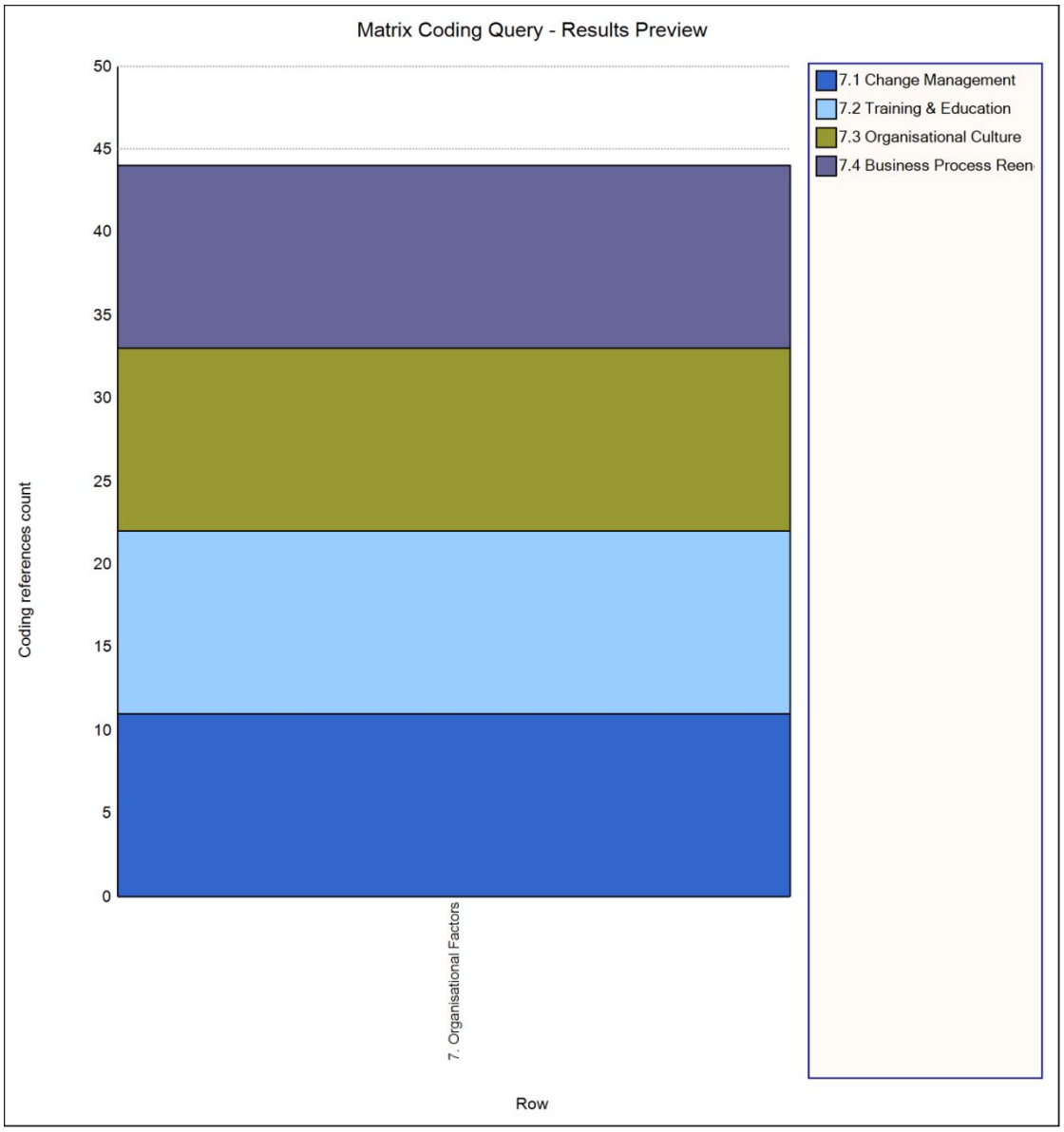

Figure 7. 9 Organisational factors sub-themes which are represented by the NVivo

The culture within the organisation is considered as the catalyst for the growth and development of employees as well as for the performance of the organisation. Analysis indicated that the organisational culture was being supported by the ERP system as it was a customized ERP and it supported the Arabic language of HEI_III. As in the words of TL02,

"The SAP ERP system which has been implemented in our university through the collaboration of German organisation is supporting the Arabic language which is very helpful for its understanding and use".

In respect of prioritizing this factor, TM04 stated,

“I will give this organisational factor six out of ten because ERP is supporting our organisational culture”.

The fourth important factor highlighted by the participants was business process re-engineering. As per the words of TL05,

“In order to implement a new system in an organisation, the processes are required to be re-engineered as per the requirement of the new system".

According to TM01,

"The business process re-engineering was done through proper planning and the results were positive”.

7.3.3 Project Factors

In an HEI implementation of an ERP system is a project which needs proper planning, feasibility checks, need assessments, evaluation of available resources and compliance with the international standards to make the project successful and effective for the improved performance of the institution. Responses of the participants gave birth to emerging sub themes which are presented in figure 7.10.

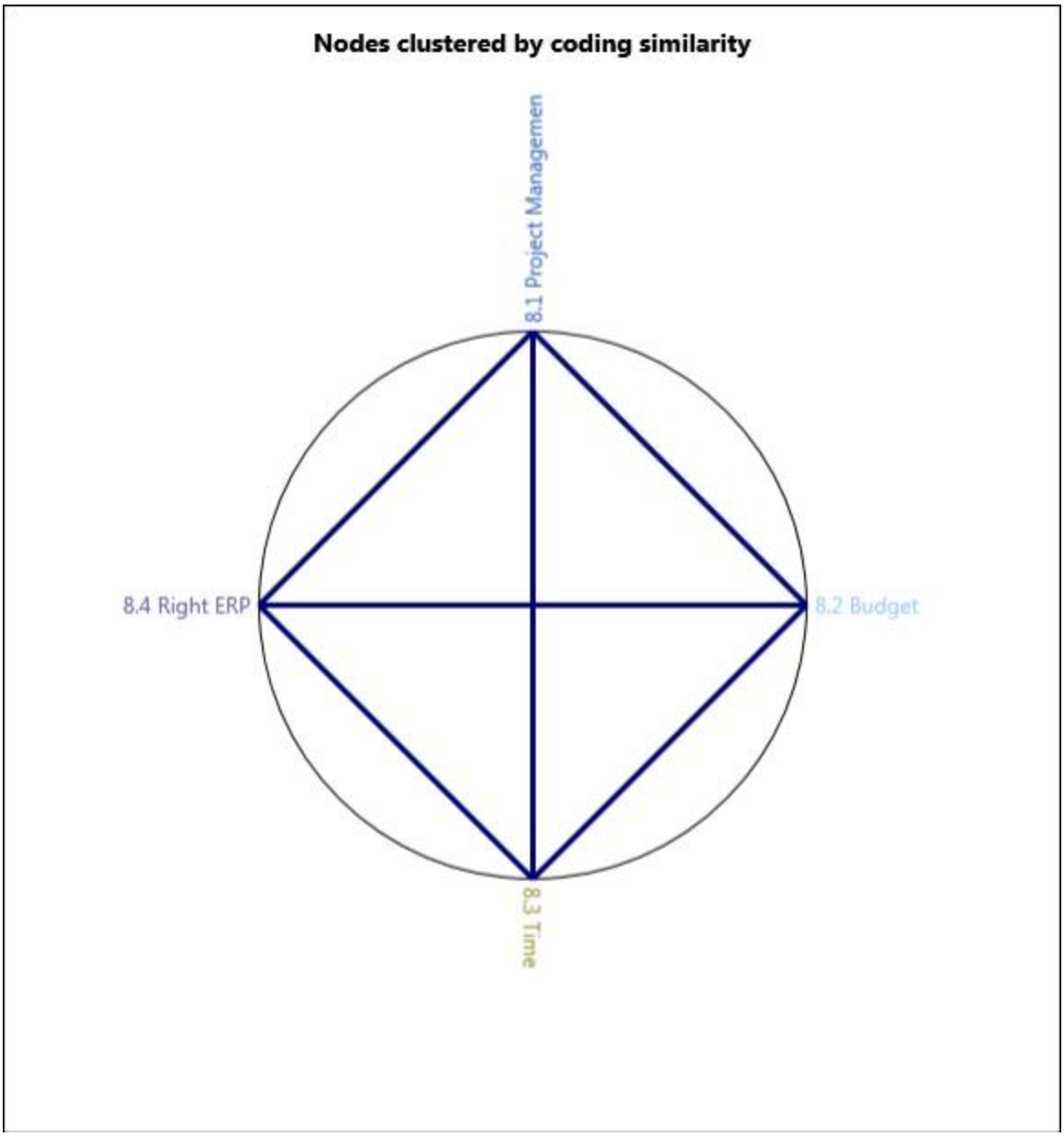

Figure 7. 10 Project factors sub-themes which are represented by the NVivo

❖ **Project Management**

In order to implement a system, it is important to manage the project from its beginning until end to make it successful. As per the TM01,

"Procedures and objectives were identified for each implementation phase of ERP system".

Project management usually involves planning, implementation, evaluation, and maintenance processes for the success of the project. As per the words of TL04,

"A project cannot be termed as successful if all the phases and stages of the project are being evaluated successfully separately".

Analysis of the responses indicated that in the process of project management there were some issues of technical nature which caused problems for the management and also affected the successful implementation of ERP in the Institute. According to TM04,

"During the project management, some issues were influencing the success of ERP and one such issue was the provision of technical staff and its acceptability for the new system".

All of the participants gave this factor high importance on their priority chart.

- **Budget**

The introduction of the new system and its implementation requires financial resources at each stage of the project. It was also revealed in the analysis that cost is also considered as a measurement tool or instrument for evaluation of successful ERP system. As in the words of TL02,

"An important step in the pre implementation phase is the estimation of cost for the successful implementation of the project and after that, the maintenance cost should also be considered in making provisions".

Similarly, the evaluation of a project cannot be measured directly through the cost of the project but it should be seen in terms of long term benefits and advantages of the project. In the words of TL05,

"The cost of the project should not overshadow the long term advantages which can be achieved from the project".

Analysis revealed that implementation of ERP system in HEI_III was funded by German organisation; therefore the burden of cost was not on the shoulders of university management. In the words of TM06,

"The implementation of SAP in our university was a German funded project, although the SAP is the most expensive ERP system in the world but it is German software that is why the cost was borne by the vendor".

❖ **Time**

Time management is one of the most important aspects while managing a project and measuring its success in terms of time value of money. In terms of timely implementation and integration of all processes, the efficient use of time can be an issue. As per the words of TL01,

"We have adopted the big bang approach in which we implemented all modules of ERP system in all the departments of the organisation at the same time".

Analysis of the responses indicated that the SAP project was carried out on time and the vendor implemented the ERP system within the set time frame. As in the words TM05,

"The SAP project was on time and also the vendor implemented the system on time".

The majority of the participants gave this factor medium priority because there were no issues of poor time management or mismanagement of time which can affect the success of right ERP system.

❖ **Right ERP System**

As per the analysis of responses the selection of ERP system on the basis of management was the best decision so it can be said that in the context of management, right ERP has been selected and implemented in HEI_III. As in the words of TL01,

"The SAP is the most efficient and most used ERP system in the world which is the best available ERP system in the world".

Responses revealed that the technical side of the SAP is making some issues for the university management because SAP is a very complex system which is not easy to use. As in the words of TL05,

"Based on the management the ERP system was 100% right but the technical side of the system is somewhat not right because the system is too complicated".

Similarly, TM03 narrated that,

"An ERP system can be best in one context but it can make some difficulty in another context so in order to select a right ERP, management as well as technical sides should be considered".

The majority of the participants gave the factor of right ERP selection a high priority in the context of HEI_III. As in the words of TL04,

"Ten out of ten should be given to this factor because if the wrong ERP system has been selected then all the subsequent efforts to implement it and make it successful go in vain"

7.3.4 Project Support System Factors

A continuous support and commitment are required from the technical staff and from the top management to make the project successful at its end. Therefore at the time of evaluation, the support factors should be given much importance. Questions within the interview protocol which were addressing this predefined theme indicated some important factors as emerging sub themes presented as figure 7.11.

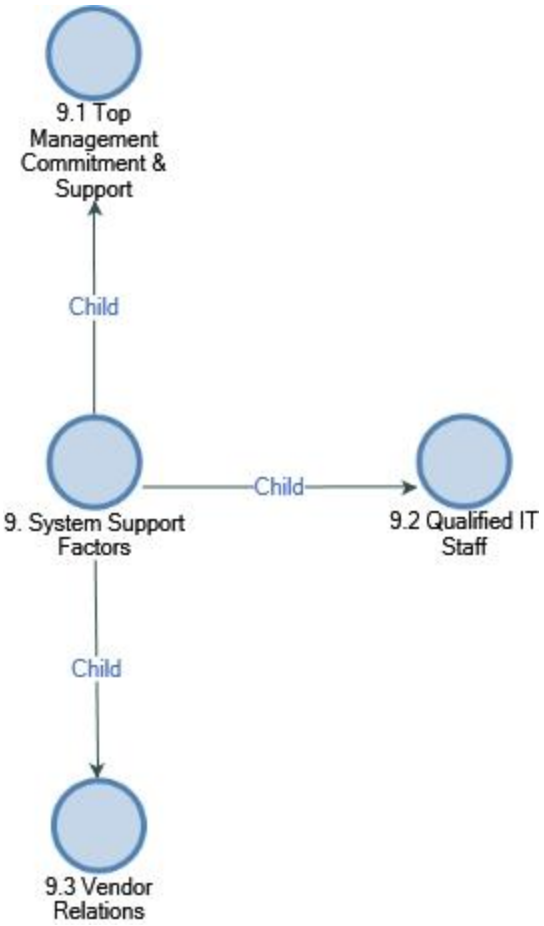

Figure 7. 11 Project Support System Factors sub-themes

❖ **<u>Top Management Commitment and Support</u>**

Implementation of a project is not a one day job. It requires continuous evaluation and monitoring, therefore, the support and commitment from the top management is required at each phase of the implementation process. As per the words of TM06,

"All the phases of the ERP system require a similar amount of consideration, commitment, and support from the top management to make the implementation successful till its end".

Analysis of the responses indicated that management of the HEI_III is very committed and supportive in this regard and they haven't lost their interest till the post implementation phase. According to TL05,

"The top management of the university is well aware of the importance of the ERP system and its help in their decision-making process so the management is trying its level best to support and handle the different issues of implementation".

- **Qualified IT Staff**

It has been identified by the respondents that the staff members of the university, as well as the students, are the users of ERP system. In the daily activities and operations by the users through ERP system continuous support from the IT staff is required for day to day functions and issues. Hence the participants were of the view that the qualified IT staff should be recruited which can utilize the ERP system at its maximum level. As per the words of TM04,

"There is a lack of qualified and trained IT staff in the organisation and ERP system cannot be deemed successful without the support of IT staff".

Qualified IT staff is also considered as a stakeholder who can evaluate and monitor the system as per their knowledge and experience; therefore the lack of IT staff means the evaluation of ERP system will get affected. As in the words of TM03,

"The qualified IT staff is in a better position to evaluate the ERP system because they have more knowledge and experience in this regard".

Similarly, TM05 indicated that

"The I.T staff of the university was not that much ready for the new ERP system that is why they didn't respond well towards their training and there is an issue of resistance by the IT staff".

The majority of the respondents ranked this factor high on their priority list because the qualified IT staff and the resistance by the staff are creating problems for the successful implementation of ERP system in HEI_III.

- **Vendor Relations**

As it has been mentioned earlier that, implementation of an ERP system is not a one day job and it's not a one purchase item either. For the HEI_III, the Integrated Technology Group (ITG) is the

vendor of German software SAP and ITG is a German organisation, hence the best vendor was selected for the purchase of SAP ERP system. As in the words of TM01,

"The HEI_III *and ITG signed a cooperation agreement in 2006 for the implementation of the educational and technological solution at* HEI_III *".*

Responses by the participants have revealed that the higher education institution has a very good and operative relation with its vendor since the time of signed agreement. Analysis revealed that institution is utilizing the facility of training for their students for the use of ERP system in theoretical perspective as well as in practical perspective. As per the words of TL01,

"Our institution has a very cooperative relationship with the vendor and HEI_III *students are supposed to attend Dual Study Programme by SAP to gain experience".*

7.4 Mapping Key Success Factors across the life cycle phases of ERP Implementation

7.4.1 ERP implementation life cycle phases

The third section of the analysis is defined to explore those issues and challenges which have been faced by university management at different phases of ERP implementation in HEI_III. The review of the literature and research questions has identified that implementation of ERP system can be divided into three phases which are pre implementation, implementation and post implementation phase in section (3.4). There are two stages of each phase of the implementation namely initiation and adoption of pre implementation phase, stages of implementation and shakedown for the implementation phase, whereas the last two stages are evaluation and optimization for post implementation phase. Under this section of the analysis, the three phases of the implementation were identified as the themes and stages were also pre-defined sub themes. Responses by the participants under each phase and stage of the implementation identified the emerging sub themes for the purpose of coding and analysis. It has been viewed that different factors and challenges affected the implementation of ERP system at different phase and stage. The predefined themes and emerging sub themes identified during the coding are shown in table 7.3.

Table 7. 3 Mapping Key Success Factors across the life cycle phases of ERP Implementation

Themes (Parent Nodes)	Sub-Themes (Child Nodes)

Pre-Implementation Phase	• Initiation Stage
	  ○ Budget
	  ○ Right ERP
	• Adoption Stage
	  ○ Organisational Culture
	  ○ Training and Education
	  ○ Business Process Re-engineering

Implementation Phase	• Implementation Stage
	  ○ Qualified IT staff
	  ○ Vendor Relations
	  ○ Top Management Commitment & Support
	  ○ Project Management
	  ○ Change Management
	  ○ Time
	  ○ IT Infrastructure
	• Shake Down Stage
	  ○ Qualified IT Staff
	  ○ Project Management
	  ○ System Quality

Post Implementation Phase	• Evaluation Stage
	  ○ Top management Commitment and Support
	  ○ Qualified IT Staff
	• Optimization Stage
	  ○ Vendor Relations
	  ○ Information Quality

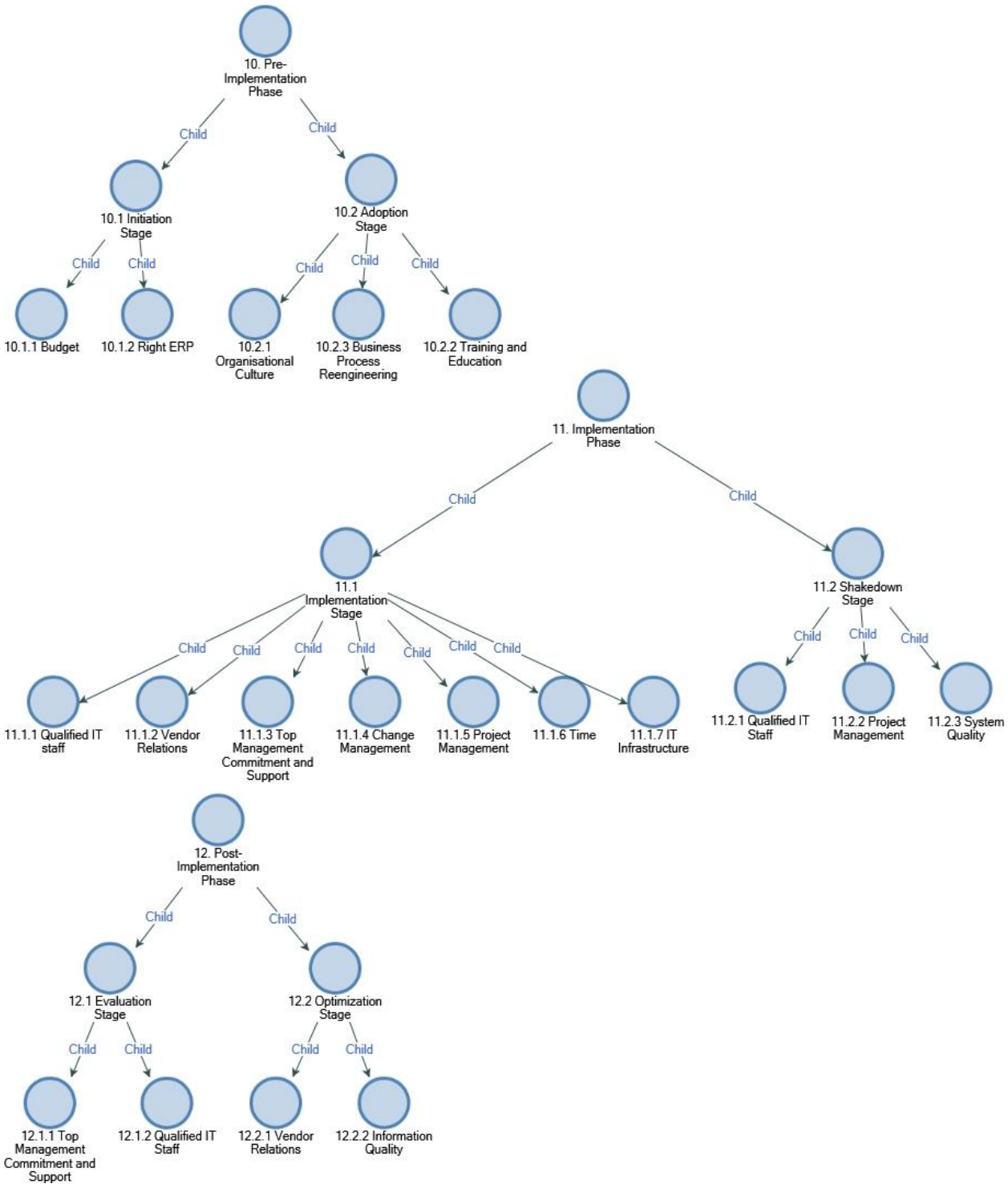

Figure 7. 12 Mapping Key Success Factors across the life cycle phases of ERP Implementation

7.4.2 Mapping ERP Implementation factors on Implementation Life Cycle Phases

Each of the implementation phases has been divided into two stages, and the participants of the technical level were asked through the semi-structured interview protocol to prioritize the influential factors for each of the stages within each phase. Respondents provided a priority chart as per their knowledge and experience, and analysis of the responses indicated that different factors have been identified as important and influencing for different stages of the implementation phase.

The description of each influencing factor for the respective stage is as under:

As per the analysis of the responses by the participants for Pre-Implementation Phase, the influencing factors at the Initiation Stage were Budget and Right ERP selection as per the requirements of the organization. Similarly, at the stage of Adoption the Organisational Culture, Training and Education, and Business Process Reengineering had affected the successful implementation of the ERP system in HEI_III.

For the Implementation Phase, Qualified IT Staff, Vendor Relations, Top Management Commitment and Support, Project Management, Change Management, Time, and IT Infrastructure were identified as the important influencing factors by the responses of the participants. At the stage of Shakedown, Qualified IT Staff, Project Management, and System Quality were given high priority by the participants for the success of ERP system in HEI_III.

For the Post-Implementation Phase, participants highlighted the factors of Top Management Commitment and Support, and Qualified IT Staff highly important at the stage of Evaluation of ERP system, while for the Optimization stage Vendor Relations, and Information Quality were emphasized during the coding of responses provided by the participants.

The matrix coding query chart in figure (7-13) by the NVivo software is showing the importance and priority of each factor under each phase of the ERP implementation lifecycle.

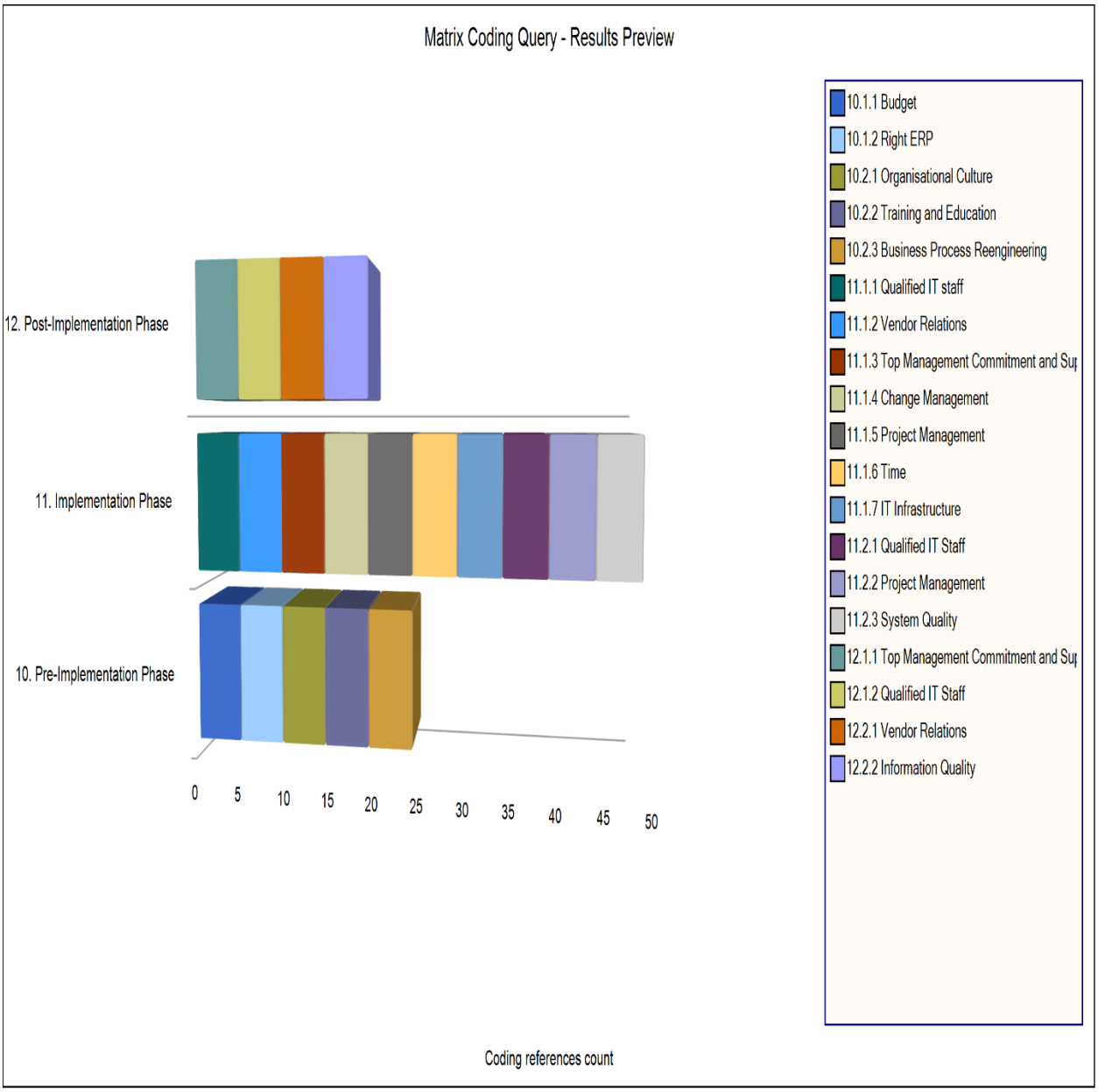

Figure 7. 13 Mapping Key Success Factors across the life cycle phases of ERP Implementation through Nvivo

7.5 Issues in Use of ERP system

In the previous section, those challenges were identified by the participants which are influencing the implementation of ERP system in the HEI_III whereas this section was designed to identify those challenges which are being faced by the users while using the ERP system in HEI_III. The semi structured interview protocol had the pre-defined questions relating to this section which was supposed to identify the issues in use of ERP system. Themes for the section are identified as per the interview protocol questions and the responses by the participants and the responses

by the participants were coded as the emerging sub themes. The responses highlighted some issues at the organisational level, individual level and also for technical complexities. Some of the important sub themes emerging under the pre-defined themes for this section are presented in table 7.4. Explanation of each theme and sub theme is given below:

Table 7. 4 Parent nodes and child for Issues in use of ERP

Themes	Sub-Themes
Problems in Using ERP	• Resistance by Staff • Expertise for Complexities of SAP
Maintaining ERP	• Maintenance Cost • Qualified IT Staff Support
Transfer of information from old information system to New ERP	• Data Migration Approach

7.5.1 Problems in Using ERP system

Analysis of the responses by the participants (Top level and technical level) highlighted some organisational, Personal and technical issues which were influencing the use of ERP system. Participants identified these issues as per their understanding, knowledge, and experience and they were of the view that these issues are also affecting the success of ERP system. As these issues are limiting the use of ERP system which subsequently affects the achievement of targets or goals set by the university management. Emerging sub themes as per the coding of responses are presented in figure 7.14.

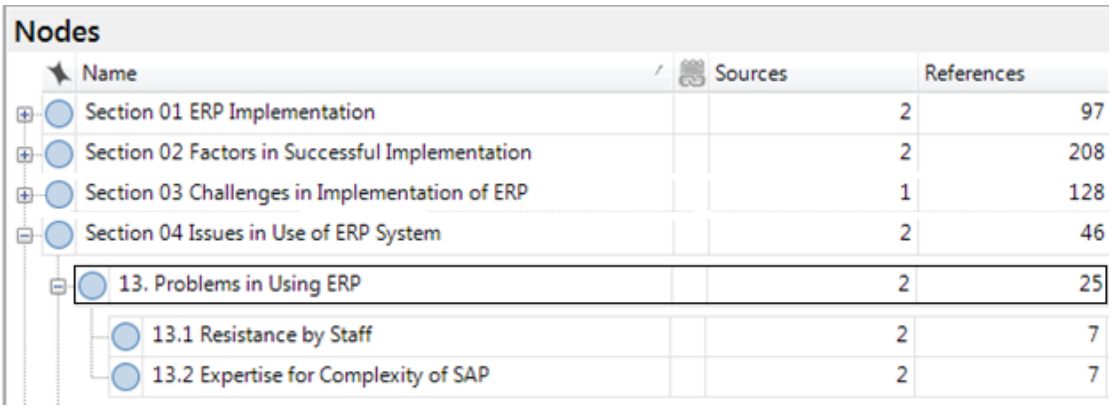

Figure 7. 14 Emerging sub themes as per the coding of responses

❖ **Resistance by Staff**

As per the responses of the participants, the staff of the university has been showing non-responsiveness and reluctance towards the adoption of ERP system because they are not mentally prepared for the transition and acceptance of the new system. This resistance by the staff members is limiting the use of ERP system and affecting the overall performance of ERP. As in the words of TM04,

"Resistance to change by staff is the main problem. This because doesn't want to adapt to change and they had not provided the good response to training as well".

Similarly as per TM05 and TL01,

"Staff was not ready for the change and using the ERP system".

TL04 and TL05 highlighted the issue of resistance by staff in these words,

"The staff of university had their own preferences and reasons for non-acceptance of ERP system which has affected the utilization of ERP system at its fullest because the issue of resistance is still unresolved".

❖ **Expertise for Complexities of SAP**

As mentioned earlier, SAP is the biggest ERP system in the world and it is an also very complicated and sophisticated system which requires a proper and extensive training for use of its different features. As per the analysis of responses by top management and technical level participants, SAP is a complex system which requires competent and qualified IT staff to train the users of ERP system as well as evaluate the performance of SAP in accordance with the pre-defined targets. In the words of TM06,

"SAP is a very sophisticated system and is not easy to be learned".

Similarly, TM03 emphasized the lack of IT experts by stating,

"The most important problems faced by the university in using ERP system is the lack of IT experts for the continuous support of SAP while the IT staff present is not trained enough to use the complex functions of SAP for its maximum utilization".

Participants also highlighted the need for training and education for the users especially students for the use of ERP system, as the students are the end users of the ERP system as well as the university facilities. As per the words of TL02,

"The basic purpose of the implementation of SAP was the facilitation of e-learning and the e-learning was for students' therefore training of students is essential for the promotion of the use of ERP system, hence steps are being taken to increase the knowledge of users".

7.5.2 Maintaining ERP

Any project being implemented in an organisation needs a continuous monitoring and maintenance of its usage and evaluation. A number of factors are being involved in the maintenance of ERP system and any short fall in the maintenance or any problem in the maintenance factors can affect the performance of ERP system as well as the overall performance of the organisation. The important features of the maintenance of the ERP system are being highlighted by the respondents through their semi structured interview responses and are coded as emerging sub themes as shown in figure (7-16).

Maintenance Cost

Technical level participants were of the view that organisation must make provisions for the maintenance cost for the running of ERP system and must make contingencies for any unforeseen circumstances which can demand recurrent expenses, for example, security issues or viruses etc. As per the words of TL04, and TL05,

"The maintenance cost for the SAP is very high. If it not had been funded by the German organisation, the maintenance cost would have become a problem for the HEI_III *as SAP is the most expensive ERP system"*.

Similarly, TL03 stated that,

"One of the challenges in maintaining ERP system can be the maintenance of SAP and provisions should be made for this issue".

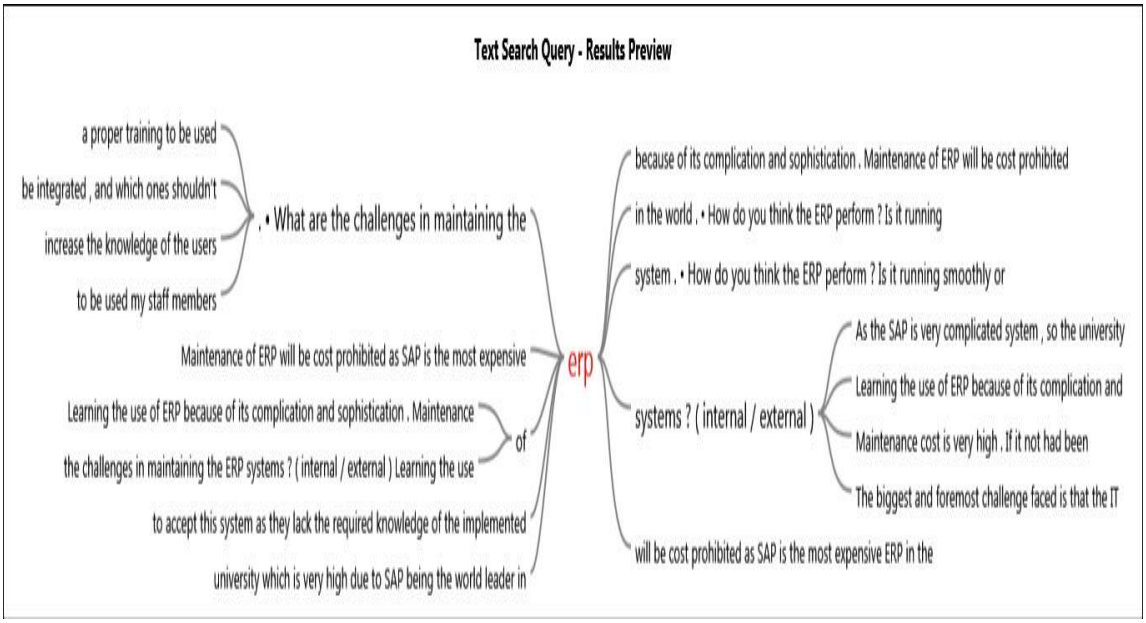

Figure 7. 15 Maintenance Cost text Query

Qualified IT Staff

As mentioned earlier and indicated by the analysis of the responses, qualified IT staff is required to perform day to day functions for the smooth running of ERP system and for the achievement

of best possible results hence the qualified, competent and experienced IT experts are needed within the organisation to maintain the ERP system as well as evaluate its performance. Technical level participants were of the view that there is a lack of qualified IT experts in the HEI_III who can facilitate the maintenance of ERP system and can also help in training the users of ERP system. As per TL02,

“The biggest and the foremost challenge faced by the university in maintaining SAP is that the IT staff is not ready to accept the system because they lack the needed knowledge and expertise for the successful implementation of ERP system”.

Similarly, TL03 indicated that,

“The challenge in maintaining ERP system is learning the use of ERP system because of its complication and sophistication”.

Responses also revealed that training and education arrangements have been made to facilitate the users and encourage them for the use of SAP so that the system can be better maintained and evaluated at the end. In the words of TL01,

"As the SAP is a complicated system so the university has made some arrangements to train and educate the students about the use of SAP in theoretical practice and at workplace experience. Technical staff at the university is not trained enough to use the SAP at its fullest".

7.5.3 Transfer of information from old information system to New ERP

Technical level participants were inquired about their knowledge or the transfer of information from the old information system to new ERP system as this is considered as the most influential stage for the adoption of ERP system. An important technical factor which is the quality of information depends upon this transitional stage which can subsequently affect the quality and performance of ERP system. Responses of the participants were coded as emerging sub themes and are shown in figure 7.16.

Figure 7. 16 Transfer of information from old information system to New ERP

❖ **Data Migration Approach**

All of the technical level participants were of the view that skills and expertise are required for this process of transferring the data transfer of information from one information system to an ERP system can influence the modular effectiveness of system, as well as any error, omission, or mistake in the process of inputting data to ERP system, can have a retrospective effect on the quality of system and achievement of targets. As per technical level participants, data migration approach was adopted through proper measures and planning by vendor and HEI_III to transfer the information from old information system to ERP system. As per TL02,

"Strict procedures were followed while transferring the information and it was ensured that no data gets lost and minimum resources are being used to their fullest for timely completion of information migration process".

According to TL02,

"The organisation transferred the information by developing a strategy. IT department of the university and our ERP vendor handled the data migration process".

TL03 narrated,

"The whole project of integration of SAP was a German funded project and SAP is a product of German based firm. Hence it was ensured that all the processes of information transfer were done as per streamlined and in a professional manner".

TL04 and TL05 shared their views by saying,

"IT staff of the university and vendor of ERP system made a strategy to migrate the information from old system to new ERP system and this resulted in very fewer problems during the process.

7.6 Evaluation of ERP Performance

This section of analysis was developed to evaluate the ERP system in HEI_III. The fourth research question of the study had the basic concept of evaluation of ERP system hence this section was defined in accordance to the fourth research question. In this section, those instruments or methods are being identified which are currently used for the evaluation of the performance of ERP system. Top management and technical level participants provided their views and opinions about the evaluation and performance of the ERP system as per their knowledge and experience. The questions within the interview protocol identified the themes for the section while the responses of the participants under these themes gave birth to the emerging sub themes for the purpose of analysis. Presentation of the themes and sub themes under this section is being presented in table 7.5.

Table 7. 5 Evaluation of ERP outcome parent nodes and child nodes

Themes	Sub-Themes
Instruments/Methods for measuring ERP outcomes	• Improvement in Performance • Targets • Stakeholder's Satisfaction
Stakeholders	• Definition • Stakeholder's Satisfaction
ERP Performance Evaluation	• In-Between with Difficulties

Productivity	• Effect of ERP on Productivity • Deficiencies
Improvement in ERP System & Future Expectations	• Training and Education • Qualified IT Staff • Understandability • Maintenance Cost

7.6.1 Measuring ERP outcomes

Top management and technical level participants were questioned about their knowledge of any existing instrument being adopted by the management of HEI_III for the purpose of measurement of ERP performance and its outcomes. Coding of the responses by the participants identified three main instruments which are the improvement in performance, achievement of targets, and satisfaction of stakeholders as the main instruments to measure the ERP outcomes. Presentation of emerging sub themes as per the coding of references is provided in figure 7.17.

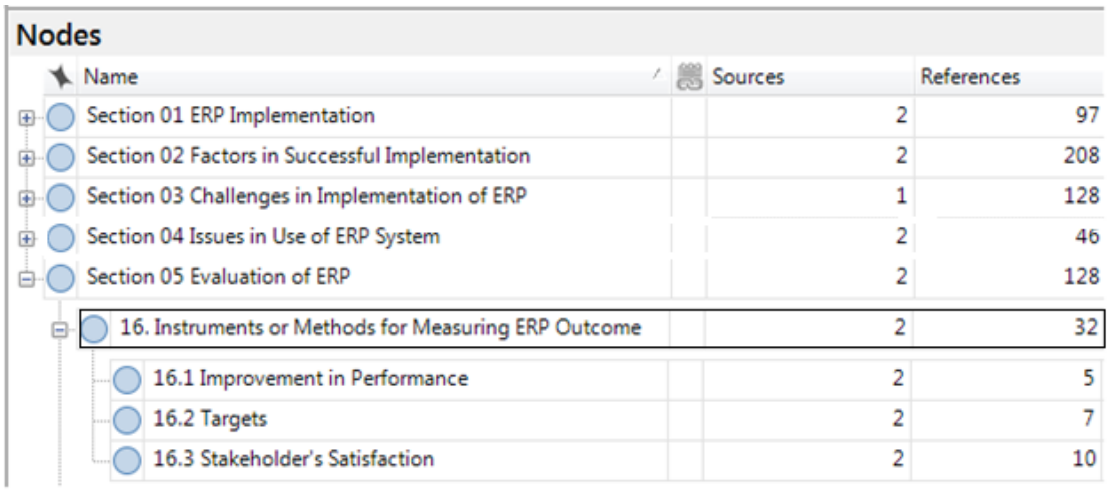

Figure 7. 17 Instruments/Methods for Measuring ERP outcomes

❖ **Improvement in Performance**

One of the important method or instrument identified by the participants was the improvement in performance of the HEI. This measurement tool was also emphasized during the reasons for the implementation of the ERP system. As per the words of TL04 and TL05,

"One of the prevailing instruments for the measurement of ERP outcomes is the significant improvement in the performance of organisation which has been brought due to the adoption of standardized international ERP system".

❖ **Targets**

Before the implementation of the ERP system, the management of the organisation tends to define and set some targets to be achieved through the success of the project. Achievement of these pre-defined targets can serve as an evaluation tool for the measurement of project outcomes. As per the words of TM03,

"The ERP system can be evaluated against the intended goals and targets which were set by the top management of the organisation".

In the words of TL01,

"Success is defined as the achievement of something desired, planned, or attempted which implies that targets to be achieved have to be defined and success can be evaluated through them".

❖ **Stakeholder's Satisfaction**

Analysis of the responses revealed that all of the participants were of the view that the satisfaction of stakeholders is one of the most important and crucial instruments for the measurement of ERP system. Stakeholders are the users of ERP system and their satisfaction indicates the success and acceptability of ERP system within an organisation. As per TM06, TM05, TM03, TL04, and TL05,

"The end user satisfaction is used as an instrument to measure the performance of ERP system as the successful system will give satisfied users".

7.6.2 Stakeholders Assessment

For the evaluation of the ERP system, it is important to define and identify the meaning of stakeholders and their satisfaction to measure the success of ERP system. In the semi structured interview protocol, the participants were questioned about their understanding of stakeholders in HEI and their satisfaction for the evaluation of ERP system. Responses provided the emerging sub themes which are presented in NVivo figure 7.18.

Figure 7. 18 Stakeholders emerging sub themes through Nvivo

❖ **Definition**

Responses of the technical level participants gave the information about the meaning of stakeholders for their educational setup. Analysis of the responses indicated that all of the participants were of the view that all users of ERP system can be defined as stakeholders and their satisfaction is important for the evaluation of ERP system. According to TL04,

"As per my understanding users of ERP system are the stakeholders for ERP system".

Similarly, as per TL03,

"Staff members of the university and students are the main users of ERP system and they are stakeholders for the purpose of evaluation of ERP".

❖ **Stakeholder's Satisfaction**

One of the important instruments highlighted by the participants through their responses for the measurement of ERP outcomes was the satisfaction of stakeholders. Top management and technical level participants were questioned about the suitability of stakeholder's satisfaction as the measurement tool for evaluation of ERP system and responses indicated that all of the participants favored this measurement tool. As in the words of TM04, TM06, TL03, and TL05,

"Stakeholder's satisfaction is the most common and best available measurement tool for the evaluation of ERP implementation within an organisation".

Some participants highlighted the need for more than one measurement instrument to be adopted to evaluate the success of ERP system. In the words of TL01, TL04, TM02, and TM06,

"Although stakeholder's satisfaction is important but more than one instrument should be used to evaluate the ERP success".

7.6.3 ERP Performance Evaluation

For the purpose of analysis, the participants of HEI_III were questioned to give their opinions and views about the success or failure of ERP system which is being implemented in their HEI. Semi structured interview protocol for both the hierarchical level (Top management and technical level) had the questions about the evaluation of ERP performance. Hence the theme has been identified as per the questions of interview protocol and the responses of the participants identified the emerging sub theme which can be termed as the evaluation of the ERP system by the top management and technical level. The emerging sub themes are shown in figure 7.19.

Figure 7. 19 ERP Performance Evaluation emerging sub-themes through Nvivo software

❖ **In-Between with Difficulties**

Analysis of responses by all of the participants indicated that top management, as well as technical level, were of the view that the prevailing ERP system in HEI_III is neither a success nor a failure but in fact it should be ranked in between because some of the difficulties and shortcomings are obstructing the 100% success of SAP in HEI_III. As in the words of TL01,

"Despite all the challenges we have faced, I believe our ERP has improved overall university performance".

Similarly, as per TL02,

"It can be said that SAP is in the middle with some little bumps on the way and measures are being taken to smooth out the process".

TL03 stated,

"SAP has some difficulties such as customization, understand-ability, and lack of training".

In the words of TM03,

"Our ERP needs more improvement and enhancement".

According to TM01 and TM02,

"There has been visible improvement in overall performance, however, some gaps still persist which needs attention and removal for the achievement of best results".

TM04 narrated,

"There is still room for improvement and enhancement in SAP ERP system".

TM05 addressed the issue of resistance while evaluating the performance of ERP system and stated,

"Although SAP is performing well, but it can be improved. And these improvements can be made after dealing with the issue of resistance by the staff".

TM06 highlighted the complexity of ERP system and said,

"SAP is a complex system and it is not easy to use, it has lots of technicalities to be understood by the normal user".

7.6.4 Effectiveness and Efficiency of organisational process

ERP system was being implemented in the HEI to improve the productivity and it has been emphasized in the responses of the participants. Productivity can also be used to evaluate the success of ERP system; therefore the semi structured interview protocol had the questions relating to the improvement in productivity and any discrepancies which are affecting the maximum productivity level to be achieved through ERP system. The emerging sub themes for the measurement of productivity are provided in figure 7.20.

Figure 7. 20 Effectiveness and Efficiency sub theme emerged through Nvivo software

❖ **Effect of ERP in Productivity**

Top management participants from the HEI_III were questioned to evaluate the success of ERP system through the measurement of productivity of the organisation. Analysis has revealed that all of the participants supported the fact that ERP system SAP 2006 has improved the overall productivity of institution. As per the words of TM01 and TM02,

"With the integration of academic and administrative functions through SAP, improvement has been observed in overall performance".

According to TM03,

"The SAP has helped the top management in strategic decision making and also facilitated the students in their administrative requirements such as making fee payments, and scheduling their academic courses"

As per TM04,

"In order to increase the productivity through ERP system, a web based system is being utilized which enabled the integration of business processes especially administrative and academic operations".

According to TM05,

"The ERP system has provided easily manageable financial solutions without compromising the security and integration of administrative functions especially financial matters with respect to academic activities so that students can manage both factors in a timely and efficient manner".

And finally as per TM06,

"In higher education institution, human resource management and financial management are normally carried out separately though in-efficient information software packages. Hence, the integration of both systems under unified software was supposed to increase productivity and performance which was provided by SAP. ".

- **Deficiencies**

As per the views of top management participants, some missing factors within the HEI which are making some issues for the improvement of productivity were highlighted. Participants suggested that elimination of these factors can enhance the overall productivity level of the organisation. In the words of TM01 and TM02,

"Technical staff, as well as students, are needed to be trained more in order to reap the maximum benefits from the ERP system".

According to TM03,

"The missing factor which can help in increase of productivity is non-willingness of staff members to adopt the new ERP system".

TM04 also highlighted the need for training and education by stating,

"More training and education is required to understand the complexity of SAP to utilize this system at its fullest".

According to TM06,

"There is a need to take the appropriate measures to increase the motivation level of staff for the use of ERP system".

7.6.5 Improvement in ERP System & Future Expectations

Some of the suggestions and recommendations provided by the participants of the study for the improvement of ERP system in HEI_III were discussed under this theme as these suggestions were asked from the participants through the semi structured interview protocol. The responses provided by the participants are coded as the emerging sub themes and are identified as the suggestions made by the participants of top management. Emerging sub themes are presented in figure 7.21.

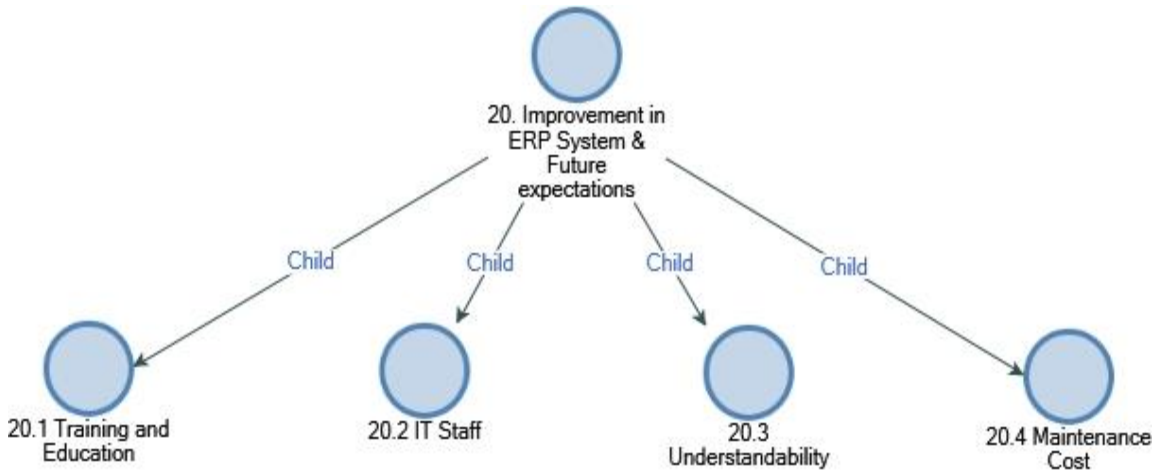

Figure 7. 21 Improvement in ERP System & Future Expectations sub theme emerged through Nvivo software

Four important suggestions were made by the participants of top management level which are training and education, IT staff recruitment, Understand-ability of ERP system and Maintenance cost. For the suggestion of training and education, TM01 and TM02 narrated,

“Training programmes for the university staff should be initiated”.

Similarly, TM03 stated,

“The training modules for the training of staff should be developed in such a way that a comprehensive knowledge can be transferred to the IT staff”.

For the second suggestion of IT staff recruitment, TM06 was of the view that,

"There is a need for qualified IT experts who can understand and have the knowledge of SAP".

Another emphasized recommendation by the participants was understand-ability of ERP system. As per TM06,

“ERP system should be smarter which can predict what is needed before we ask the system”.

Similarly, TM03 stated,

“From the future ERP system, it is expected to be easily understandable for users of all level".

TM04 narrated,

"There is a need to make SAP more user-friendly either by making SAP easier or by providing adequate training to users to achieve the required results".

Maintenance cost was recommended by TM05 in these words.

“The in house maintenance by the university staff is preferable as SAP is an expensive system. This will not only minimize the maintenance cost but will also enable the university to make the timely necessary changes”.

TM02 said,

“The system should be cost effective and it must justify its utilization and benefits with its price”.

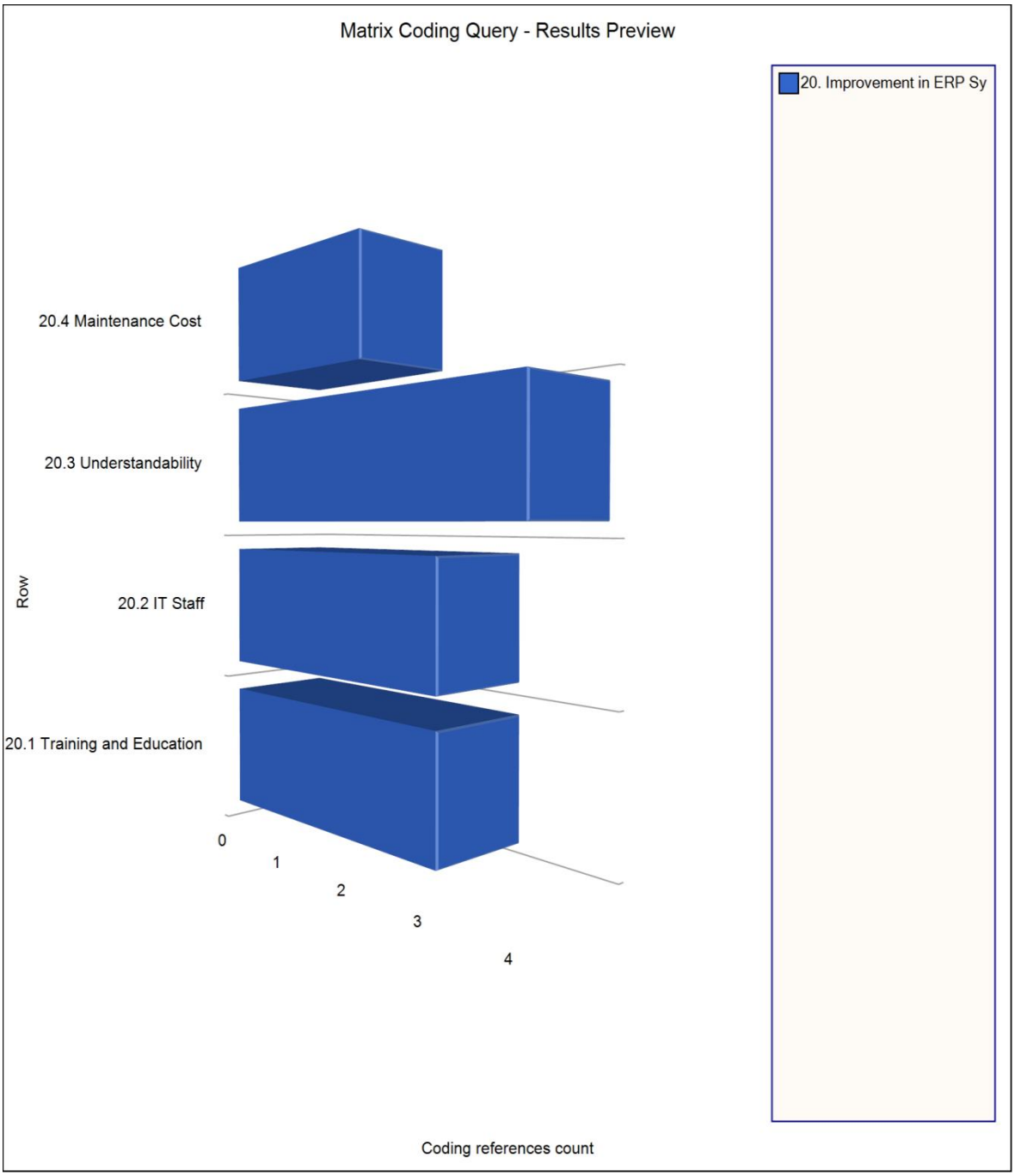

Figure 7. 22 Improvement in ERP System & Future Expectations sub theme emerged in Analysis

7.7 Chapter Summary

The empirical findings of the analysis for case study three have indicated that the implemented ERP system in in-between stage because there are difficulties which are limiting the success of ERP system in HEI_III. Selected case study is a semi government institution in which ERP system

is being implemented by a German organisation which is Integrated Technology Group (ITG) to achieve the purpose of integration for academic and administrative operations. The university had idea of e-learning to be implemented through ERP system for the improvement of business performance and enhanced accessibility of educational content at global level. SAP ERP system has been implemented which is German software and currently is in its post implementation phase. University management adopted the approach of big-bang to implement the ERP system which caused issues of resistance and non-acceptance by the users. Users are provided extensive training to understand the complexities of ERP software and its maximum utilization but this issue is still not resolved.

The key success factors identified by the participants of case study three are classified under four heads which are technical, organisational, project, and system support factors. The most influential factor for HEI_III is provision of qualified IT staff for system support purposes especially in-house maintenance of ERP system. Provision of qualified IT staff is affected by the factors of training and education as well as selection of right ERP system. As per the dominant views of the participants, SAP is a complicated and sophisticated software which is not easy to be used without advanced skills and training. It has also been highlighted that university management is encouraging students to have training of SAP through educational programmes. As per the evaluation of ERP system, the implementation performance of system can neither be termed as successful nor a failure. Hence it is in-between with some difficulties and issues. The most commonly used instruments for measurement of ERP outcomes were improvement in performance, achievement of targets, and stakeholder's satisfaction. SAP is an expensive software which requires the provisions of in-house maintenance to reduce the running expenses of the system. Other suggestions provided by the participants included enhancement in training and education, provision of IT staff and better understand ability of system to get the maximum benefits from the ERP system for achievement of targeted goals of higher education institution.

CHAPTER 8 COMPARATIVE CASES STUDIES

8.0 Chapter Overview

It has been mentioned earlier that, three case studies of HEI in Jordan have been examined in present research to assess the implacability of ERP system in within higher educational settings. These universities were HEI_I, HEI_II and HEI_III. HEI_I is a private university, HEI_II is a Jordanian official university whereas HEI_III is a Government Institute in which ERP system has been implemented through collaboration with German organisation. Semi structured interviews were conducted on purposively selected sample of three universities; participants were from top management level and technical level. Responses gathered through the interview protocol were separately analysed in NVivo software through content analysis and are being presented and analysis of each case has been presented in previous chapters.

The purpose of this comparative analysis is to examine those key factors within the selected HEIs which are influential in the successful implementation of ERP system. Three universities were the sample case studies and the current situation of ERP success in each university varies due to some specific issues and challenges associated with the implementation of ERP system. The comparison of three cases has provided an in-depth knowledge and clear understanding of issues created by multiple factors. The comparative analysis has provided a generalized knowledge from the three separate case studies and this generalized knowledge can play a useful part in higher educational sector for the adoption or successful implementation of ERP system. The specific findings from the each case study were in accordance with the views and opinions of top management and technical staff of that respective university. So the comparison of these analysis has provided the most frequently addressed issues and benefits associated with the implementation of ERP system in these three sample universities. Compared analysis has provided generalized findings which can also be helpful to the top management and technical staff of other universities to adopt ERP system or successfully implement each module of ERP system in a HEI.

In this chapter the findings of the qualitative analysis from three cases will be compared to present the similarities and differences in the implementation of ERP systems among selected HEI. This comparative analysis is structured into five sections. These five sections were the base

of analysis in all three separate case studies. These five sections of the analysis in separate case studies as well as in comparative analysis were developed in accordance with the objectives and research questions of the study. In order to make the comparison of analysis findings for three cases, more relevant and valid; the comparison is done on the basis of same five sections. Under each section themes and sub themes are being compared for three HEI's to summarize the similarities and differences in findings of three universalities.

Comparison of each theme under relevant section for three cases is given below

8.1 ERP Implementation

The first section of the analysis, analysed the prevailing ERP system being implemented in selected three institutions. In the first section of the study the reasons for the implementation of specific ERP system are being assessed through the views of participants, the strategy adopted by the management for the implementation of ERP system as well as to handle the resistance by the users for use of new system is also answered by the participants. At the pre-implementation phase of the ERP system, the staff members were provided mandatory training sessions for the use of different features of ERP system. Following ERP systems are being implemented in three universities.

Table 8. 1 Universities, Their Respective ERP systems with Phase of Implementation

S/no	University	Implemented ERP System	Phase of Implementation
1	HEI_I	Microsoft Dynamics 2012	Post Implementation Phase
2	HEI_II	Oracle 2004	Post Implementation Phase
3	HEI_III	SAP 2006	Post Implementation Phase

In each university users of ERP system were identified as staff members, faculty, and students. For each university the top management stated some objectives, or benefits which were perceived to be achieved through the successful implementation of ERP system in their higher educational institution. As per the views of top management of HEI_I the basic benefit or objective to be achieved by implementation of Microsoft Dynamics was improvement in overall performance of the educational institution by collaborating the instructional materials and training programs for students and faculty members. For the HEI_II, the basic aim for the implementation of oracle was provision of integration between academic activities and administrative operations of the university. Through the ERP system, unified ledgers, and global accounting systems were to be provided to the management and students for the ease to administrative functions. For the HEI_III, the top management identified the basic objective or benefit of integration between academic and operational activities for the ease of students, instructors, and staff members. For the HEI_III, provision of E-Learning facilities and E-content management was also one of the most appealing benefits which were supposed to be achieved through ERP system. Each of the Higher Education Institution had its own reasons for the implementation of ERP system. Reasons for each Higher Education Institution for implementation of ERP system are as:

Table 8. 2 Reasons for Implementation of ERP system in Each Selected Higher Education Institution

S/No	Reasons for Implementation	Sample Universities
1	Improvement in Overall Business Performance	HEI_I HEI_II HEI_III
2	Integration	HEI_I HEI_II HEI_III

3	Planning and Control of Inventory	HEI_I
4	Interactions	HEI_I
5	Utility	HEI_II
6	E-Learning Facilities	HEI_III

It has been observed that the feature of integration and improvement in overall performance were similar for selected three higher education institutions. The most important reason for implementation of an ERP system in any Higher Education Institution are, improvement in overall performance of the Higher Education Institutions and integration of academic activities within the administrative operations of the institute. Whereas in HEI_I assistance of ERP system in planning and control of inventory and improvement in interactions between the management and staff members through the use of information technology were also highlighted as reasons for implementation of ERP system specifically in HEI_I. In case of HEI_II, one of the reasons for implementation of ERP system was provision of accessibility to data and information and utilization of ERP's integrated features for the performance of administrative operational activities. ERP system is considered as one stop solution for students for their enrolment, registration, fee payment, and scheduling their academic activities. This feature of ERP system was specifically beneficial for the students of higher education institutions and as HEI_II has involved students and their feedback in the implementation of ERP system; Hence this utility feature of ERP is specifically considered for ease of students. For the HEI_III provision of E-Learning services and management of E-Content as per the international standards was one of the reasons for implementation of ERP system. HEI_III maintained the fact that performance of university depends upon the accessibility of global academic material to the students through information technology to compete in international markets. In case of approach which has been adopted by the HEI to implement the ERP system, two main approaches came to light which were 1) Big Bang Approach 2) Phased Roll-Out Approach. In Big Bang Approach, all the modules of the ERP system were implemented in all departments of the institution at the same time whereas

gradual implementation of step wise modules in different departments of university was done in Phased Roll-Out approach. HEI_I and HEI_III had adopted the strategy of Big Bang approach for the implementation of Microsoft Dynamics and SAP ERP system respectively; whereas, HEI_II applied the Phased Roll-Out approach for the implementation of ERP system. While implementing the ERP system in already functioning educational institution, the users of new system, especially staff members showed the resistance to adopt the new system. In such case, management has to adopt a strategy to tackle the issue of resistance. For the HEI_I, four important aspects were highlighted in responses of the participants which are consideration for human elements, incentives, user's education, and paying no attention to the issue of resistance shown by the users of ERP system. Similarly in HEI_II, the management adopted the strategy of change management, incentives for training, and forceful use of ERP system and no attention paid to issue of resistance. Whereas, according to the responses of participants of HEI_III, the administration and management of university adopted the strategies of training incentives of users and still this is an unresolved issue. It can be observed that training incentive and education of users and for the use and acceptance of ERP system is the most used strategy but still there is resistance by the users for the use of new system and this issue is still being unresolved after the adoption of multiple strategies to tackle the issue.

At the pre-implementation phase, when a new ERP system was introduced in the educational setting the staff members were provided a mandatory training which has three weeks duration in HEI_I, and one month training in both HEI_II and HEI_III. This training was provided by the vendor of the ERP system in all three universities. In HEI_I the response of the staff towards the training of the ERP system was not satisfactory and they thought that the training must be of more than three weeks duration. In HEI_II, the training was performed using web based e-learning system that enhanced the interaction and staff members were in better position to understand the meaning of training and features of ERP system more clearly. Although staff members complained about their hectic daily routines during the training sessions. In case of HEI_III the staff was not mentally ready for the training therefore they didn't pay much attention and responsiveness towards the training or use of new ERP system.

8.2 Comparison of ERP system Performance

This section of analysis identified the methods used by the educational institutions for the measurement of ERP outcomes and overall performance of ERP system is evaluated on the basis of views and opinions of the sample participants.

The top management and technical level participants of the HEI_I identified the four existing instruments or methods being used in HEI for the measurement of ERP outcomes which are evaluation of ERP system by IT staff, user satisfaction, improvement in business performance, and achievement of goals. Similarly, five methods are identified by the participants of HEI_II which are improvement in business performance, achievement of targets, stakeholder's satisfaction, timeframe and tangible benefits. In case of HEI_III, improvement in business performance, achievement of targets, and stakeholder's satisfaction are used to measure the ERP outcomes.

From these findings improvement in business performance and achievement of goals and user satisfaction are the common instruments used by all three universities for evaluation of ERP. Whereas, the evaluation by IT staff, timeframe, and tangible benefits are the specialized instruments used by the HEI_I and HEI_II as per their specific requirements.

For all three universities, stakeholders are defined as the users of ERP system which are staff members, faculty and students and the satisfaction of stakeholders' is given much importance in all three cases. The overall performance of ERP system can be evaluated as under.

Table 8. 3 The overall performance of ERP system at each university

Participants	HEI_I (Microsoft Dynamics)	HEI_II (Oracle 2004)	HEI_III (SAP 2006)
Top Management	In-Between	In-Between	In-Between
Technical Level	Failure	Success	In-Between

For the evaluation of productivity, the respondents identified the discrepancies and deficiencies for the prevailing ERP system in educational set up. In case of HEI_I, students are not part of the ERP system which has affected the integration process, also the ERP system is not user friendly and its only desktop application and not a web based system. For the HEI_II, the students are part of ERP system, and ERP is both desktop and web-based. The involvement of students in ERP system has improved the productivity through online registration and payment, scheduling, and grading of academic activities and facility of E-library. For HEI_III, the students are the part of ERP system and ERP has integrated finances, human resource, inventory, student information and management, E-Learning, and E-Content management. But the ERP system is very complicated and sophisticated which needs extensive training courses. The recommendations provided by the participants for the improvement of ERP system are student's participation, training of students, user friendliness of system, enhancement of integration, and in-house maintenance for the case of HEI_I. For HEI_II, the improvement in ERP system can be bought by increase in IT staff recruitment, proper needs assessment at the time of purchasing ERP system, improved connectivity throughout the university and effectiveness of security protocol. In respect of future expectations from the ERP system by HEI_III there is a need to improve and enhance the training and education of users of ERP system, provision of qualified IT staff for support, understandability of system for all the users, and provisions for maintenance costs for successful and effective operations of the ERP system.

8.3 Comparison of Key Successful Factors

This section of the analysis addressed those factors which were considered as influential for the successful implementation of ERP system in higher education institution. These factors are broadly classified into four heads which are technical factors, organisational factors, project factors, and system support factors. In each university, same factors are identified by the participants of the study but the prioritization of factors differs for each Higher Education Institution. The prioritization level given is the significance level. In all the three cases, participants identified those factors more important which are causing any challenge or issue in the success of ERP system. So this prioritization is not just the importance of factors. It is in fact the significance of this factor for the success of ERP implementation. This is why the prioritization ranking is different at different phases of ERP implementation. This ranking is provided by the participants.

Table 8. 4 Prioritization of KSFs in Successful implementation of ERP system at each university.

Factor	HEI-I			HEI-II			HEI-III		
	Pre.	Imple.	Post.	Pre.	Imple.	Post.	Pre.	Imple.	Post.
Change.	50%	20%	60%	35%	50%	75%	30%	55%	80%
Training	10%	60%	60%	15%	50%	70%	5%	40%	70%
BPR	30%	35%	45%	15%	45%	50%	10%	20%	40%
Or. Cult.	60%	70%	30%	50%	60%	20%	55%	65%	25%
I.T Inf.	80%	60%	20%	70%	60%	10%	75%	70%	15%
Sy. Q.	10%	35%	70%	15%	40%	75%	15%	40%	75%
Inf. Q.	5%	40%	70%	10%	45%	80%	5%	50%	85%
Time	60%	70%	70%	70%	70%	50%	70%	60%	40%
Budget	80%	40%	10%	70%	20%	5%	75%	10%	10%
Pr. Man	70%	75%	75%	80%	70%	75%	80%	80%	70%
Select.	90%	50%	10%	75%	30%	5%	70%	40%	15%
Top.M.	70%	60%	20%	70%	65%	30%	80%	70%	35%
Qual. IT	40%	75%	70%	30%	80%	75%	30%	70%	60%
Vendor.	60%	60%	65%	60%	50%	50%	70%	75%	80%

The table above is providing the priority given to each factor as per its importance and influence in successful implementation of ERP system for higher education institution. The most important key success factor for HEI_I is “right ERP” as they had implemented the bank ERP which was a total failure in respect of educational institution. Previously the bank ERP system was implemented in HEI_I because the bank has big shares in the university. But this factor was ignored that, and the functionality of bank ERP is different than the university requirements of ERP system. As per the responses of the participants, each factor has been given priority rank according to the influential characteristics of that factor for successful ERP implementation in HEI_I. In HEI_I, IT infrastructure and system quality are ranked highly influential as technical factors while change management and training/education are given high priority as organisational factors. Selection of right ERP system is given the high ranking under the head of project factors along with the budget for in-house maintenance whereas top management commitment and qualified IT staff are considered more important for the system support factors. For the HEI_II, less factors were affecting the success of ERP system and hence less factors were creating problems for the management of Higher Education Institution which means that ERP system in HEI_II has been implemented successfully and also running smoothly. Participants ranked system quality as important technical factor and from organisational factors, training and education factor is given high priority. In the classification of project factors, project management is more important while for system support; factor of qualified IT staff is ranked high. In case of HEI_III, the most important factor highlighted by the perception of participants is qualified IT staff and training of users. As per the ranking chart, system quality is given importance as technical factor while change management and factor of training/education is given high priority under organisational factors. For the prioritization of project factors, project management and selection of right ERP system are given high importance while qualified IT staff and vendor relations are considered as more critical and influential for the successful implementation of ERP system in education institution of HEI_III.

8.4 Comparison of Key Success Factors across the life cycle phases

In the third section of the analysis, the most influential challenges and issues for each phase of the ERP implementation are examined under the light of responses by participants. As per the

literature, three phases are being identified for the implementation of ERP system which are, Pre-Implementation phase, Implementation Phase and Post-Implementation phase. For each phase of implementation; two stages are being identified according to Al-Mashari et al. (2006); O'Brien and Marakas (2007): in Table 8.5.

Table 8. 5 ERP System Implementation Phases and Their Respective Stages

Stages	Pre-Implementation Phase	Implementation Phase	Post-Implementation Phase
Stage 1	Initiation Stage	Implementation Stage	Evaluation Stage
Stage 2	Adoption Stage	Shake Down Stage	Optimization Stage

For the comparison of three cases in respect of three implementation phases, the table is presented to show the mapping of each factor for each phase of ERP implementation in three cases. Table 8.6 is represented to give overall view under the broad heads of technical, organisational, project and system support factors for each phase. Each factor is being generalized in accordance with three universities through charts.

Table 8. 6 Comparing KSFs across ERP Implementation Phase in Sample Universities

Phases	HEI_I	HEI_II	HEI_III
Technical Factor			
Pre-Implementation Phase	System Quality (Integration)	-	-
Implementation Phase	Information Quality (Data Migration)	• IT Infrastructure • System Quality	• IT Infrastructure • System Quality
Post-Implementation Phase	IT Infrastructure (Non Utilization of ERP Functions)	• System Quality • Information Quality	Information Quality
Organisational Factors			

Pre-Implementation Phase	-	• Organisational Culture • Training and Education • Business Process Reengineering	• Organisational Culture • Training and Education • Business Process Reengineering
Implementation Phase	Business Process Reengineering	• Change Management • Training	Change Management
Post-Implementation Phase	• Change Management and Organisational Culture (Resistance by Users) • Training and Education (Lack of Adaptation)	-	-
Project Factors			
Pre-Implementation Phase	• Budget (Cost) • Right ERP system for Project Management (Compatibility)	• Budget • Right ERP	• Budget • Right ERP
Implementation Phase	Right ERP System and Time Management (Goals Ambiguity)	• Project Management • Time	• Project Management • Time
Post-Implementation Phase	-	-	-
System Support Factors			

Pre-Implementation Phase	Top Management Commitment	Top Management Commitment	-
Implementation Phase	Vendor Relations	• Qualified IT Staff • Vendor Relations	• Qualified IT Staff • Vendor Relations • Top Management Commitment
Post-Implementation Phase	Top Management Commitment and Qualified IT Staff Support (Measurement Plans)	• Qualified IT Staff • Vendor Relations	• Top Management Commitment • Qualified IT Staff • Vendor Relations

In summarizing the comparison it can be said that selection of right ERP system is the most important KSF for HEI_I while qualified IT staff for system support and provision of in house maintenance to ERP system is the most important KSF for HEI_II and in case of HEI_III, the most important factor is training and education for qualified IT staff through good vendor relations. Each factor is mapped separately for three cases in three phases of implementation with the help of charts which are presented below.

In this stop each factor across three phases in all three universities is providing generalized knowledge of ranking and importance. As per the views of participants the ranking presented in each factor chart can be compared with the table 8.4 i.e. prioritization of factors for implementation of ERP system.

Table 8.6 presenting challenges at each implementation phase for three universities and all these charts are linked together and can be compared for the generalization.

8.4.1 Technical Factors

❖ **I.T Infrastructure**

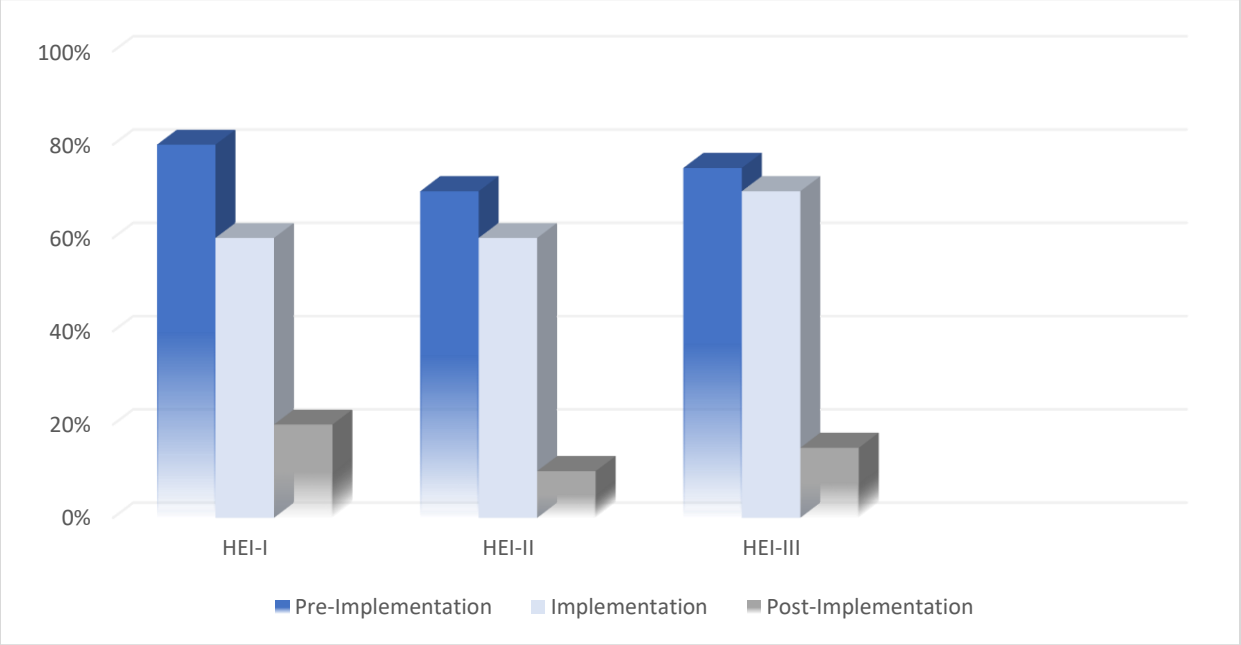

Figure 8. 1 I.T Infrastructure factor across ERP implementation Lifecycle

For the technical factor of IT Infrastructure, the graph represents the importance of this factor for each HEI and for every phase of ERP implementation.

The prioritization ranking has been provided by participants of each university. Low priority <25% on ranking scale medium (25 % ≤ 50%) and highest > 50%. Each university has identified the importance of each factor for all the three phases and this importance or prioritization is provided by participants. In the pre implementation phase, HEI_I is showing 80% meaning high priority while for HEI_II and HEI_III, ranking provided by participants was high at same phase. So, it can be said that I.T infrastructure must be ready and compatible with ERP system requirements at the pre-implementation phase. In HEI_I ERP system in an educational setup, the availability of technical resources and their best utilization can be considered as the key factor. Need of proper and updated IT infrastructure cannot be ignored while planning for the implementation of new ERP system. Top management and technical management identified that the IT infrastructure and IT support is essential for the implementation as well as the post implementation phase of the ERP system. However, at HEI_II IT infrastructure is the most important factor which cannot be neglected while planning for the implementation of the ERP system in any organisation,

therefore IT infrastructure should be ranked high in priority list at pre-implementation and implementation phases. On the other hand, HEI_III, Availability of updated technical resources and their maximum utilization can ensure the smooth and successful implementation of a software system. Top level participants, as well as technical level participants, highlighted the need of IT infrastructure for the successful implementation of ERP system at pre- implementation as well as implementation phases.

❖ **System Quality**

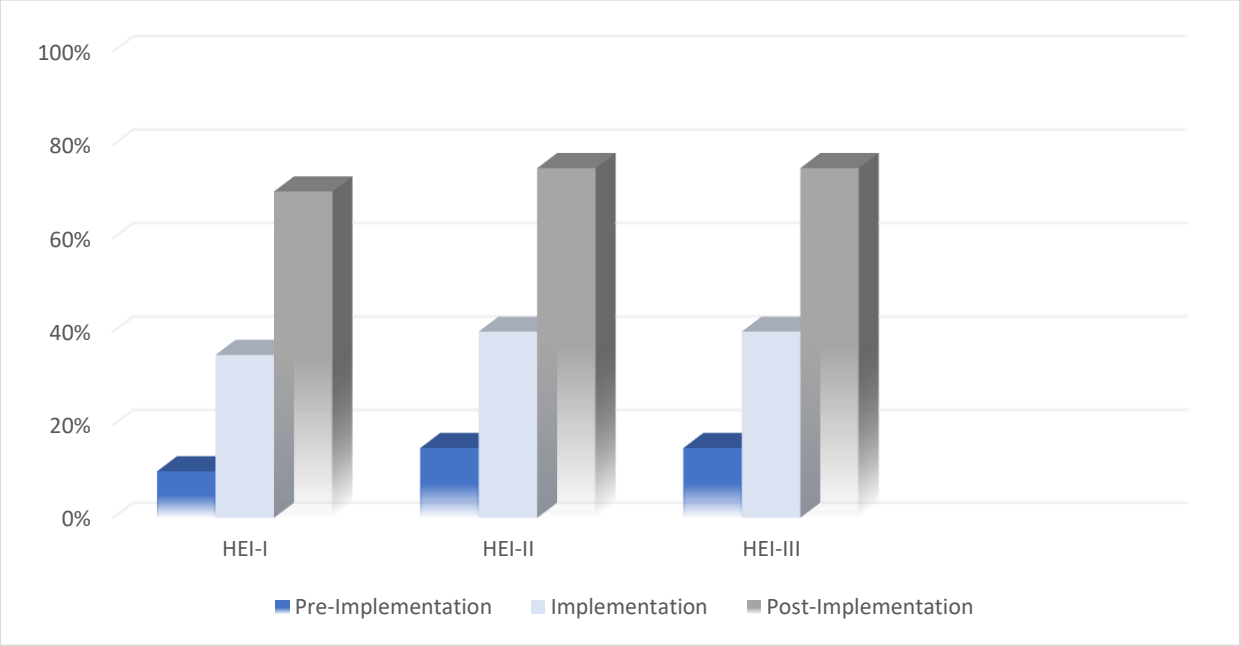

Figure 8. 2 System Quality factor across ERP implementation Lifecycle

For HEI_I, system quality was considered highly important at post-implementation phase because they had an experience of failed bank ERP system previously. For HEI_II, Oracle was a good choice but they suffered some issues of integration at implementation phase. In HEI_III, the ERP system SAP is highly complicated and complex which is not easy to use and caused some issues at the implementation phase. The system of ERP is integrated in nature, it can be a "one-system-only information and knowledge system" making it important for the successful operation of a business organization at post implementation phase at all three universities. Here the quality of the system is necessary to ensure the beneficial exploitation of the IS giving rise to a competitive edge. Therefore, system quality is a key factor for the post implementation phase ensuring and influencing the implementation of ERP in an efficient manner.

❖ **Information Quality**

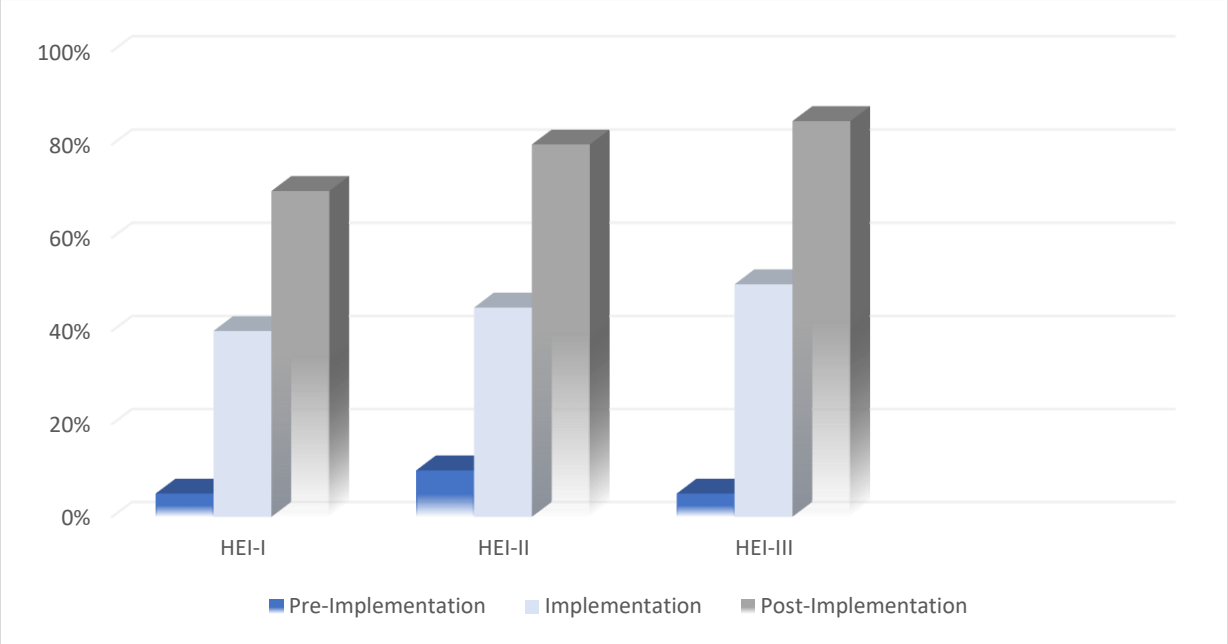

Figure 8. 3 Information Quality factor across ERP implementation Lifecycle

In HEI_I, at implementation phase there were issues of data migration because the vendor was responsible to transfer the information from old information system to new ERP system (Microsoft Dynamics). While in HEI_II and HEI_III, information quality was important at post implementation phase. Thus, it can be said information quality an influence factor at the post implementation phase. In relation to ERP quality is related to the value of the data obtained from the system. An ERP for an educational institution is required to support every organizational process, including: campus management for students and academic services as an educational administration system; student procurement and lifecycle management; analytics; research; and asset management. It is necessary that a suitable knowledge base is built while using any ERP model as such an implementation calls for the large-scale integration of information for staff and students.

8.4.2 Organisational Factors

❖ **Change Management**

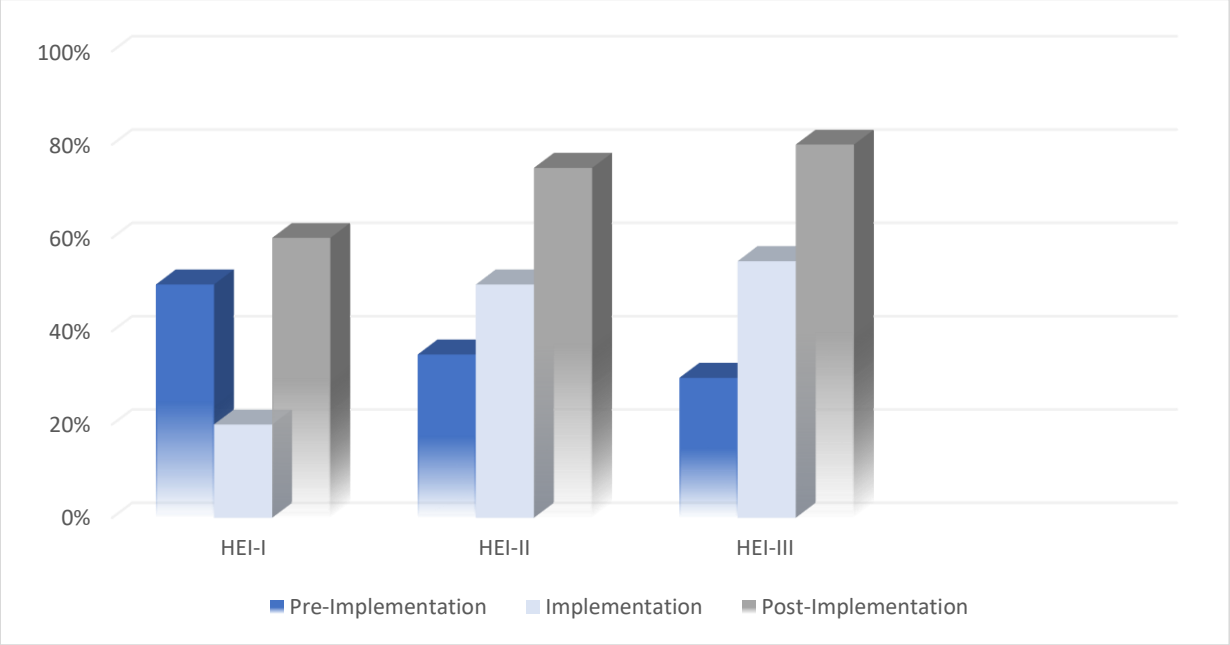

Figure 8. 4 Change Management factor across ERP implementation Lifecycle

For the organisational factor of change management, HEI_I suffered the issue of resistance by the users for adoption and acceptance of new ERP system at post implementation phase while in HEI_II this specific factor was moderately influential at implementation phase. In case of HEI_III, the change from old system to new ERP system was not managed properly which caused some issues of resistance and non-acceptance by users at implementation phase.

❖ **Training and Education**

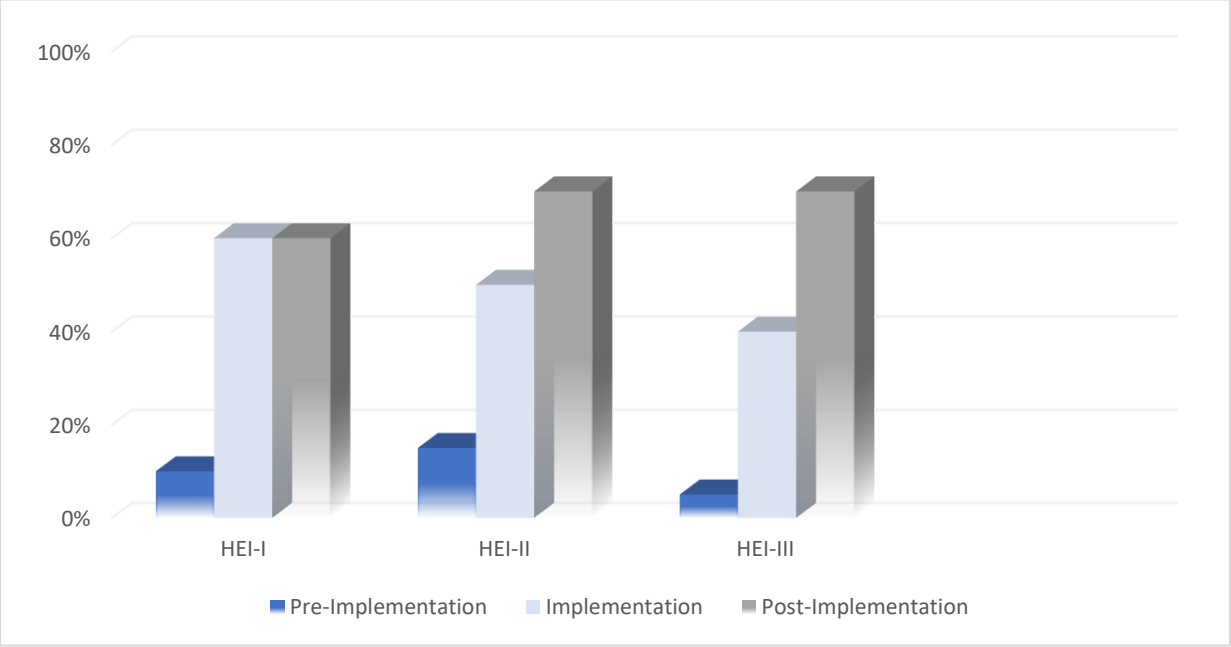

Figure 8. 5 Training and Education factor across ERP implementation Lifecycle

One of the important factors is training and education of users which is ranked high in all three universities. In HEI_I, lack of training and education is causing problems at post implementation phase, while in HEI_II and HEI_III training and education was highly influential at pre implementation phase of ERP system. It is noted that HEI_III has ranked this factor at its highest priority because the lack of training is causing resistance, non-acceptance and non-understandability of ERP system by users.

❖ **Organisational Culture**

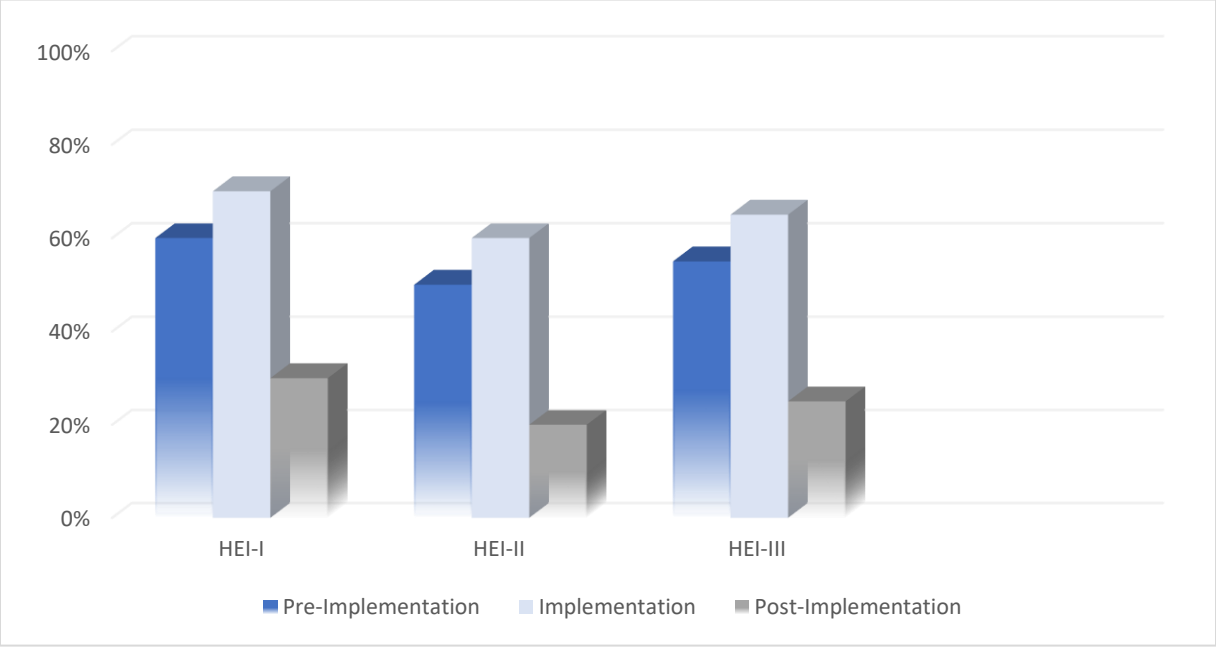

Figure 8. 6 Organisational Culture factor across ERP implementation Lifecycle

In HEI_I, Organisational culture is affecting the success of ERP to some extent at post implementation phase. In HEI_II and HEI_III, the organisational culture was not supportive at pre implementation phase.

❖ **Business Process Re-Engineering**

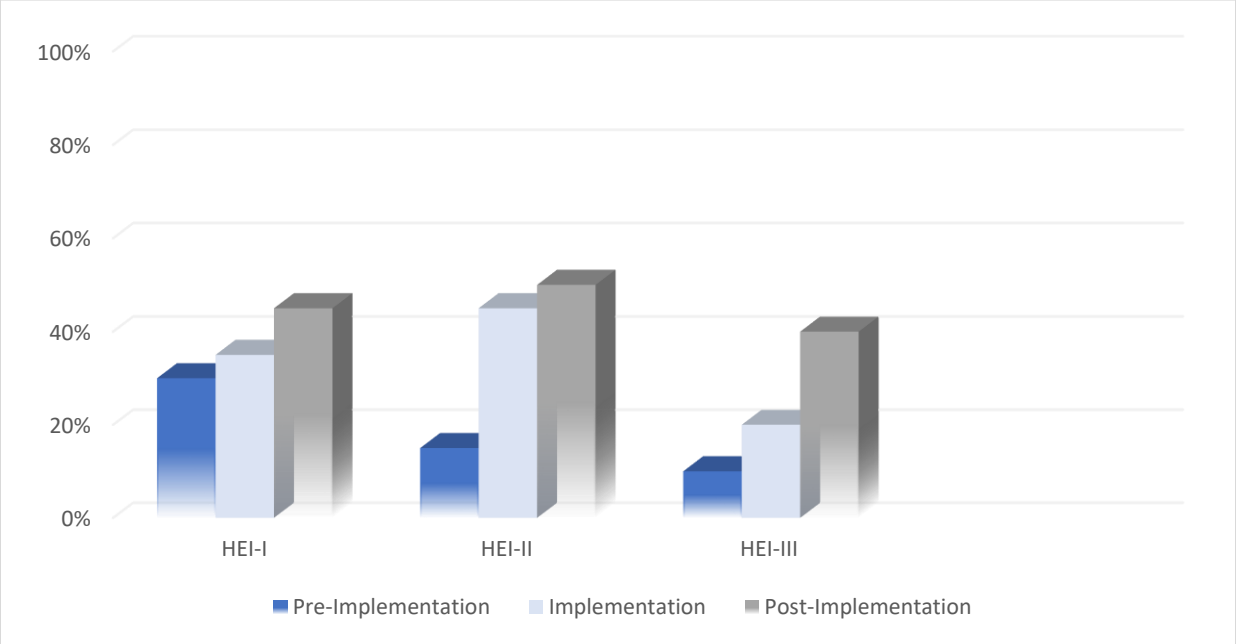

Figure 8. 7 Business Process Re-engineering across ERP implementation Lifecycle

In HEI_I, some issues were reported at the implementation phase to incorporate the ERP system within the running business processes. While at HEI_II and HEI_III, this factor is not much influential because of proper planning and management. Thus, it can be said that BPR is an influential factor in the post-implementation phase.

8.4.3 Projects Factors

❖ **Project Management**

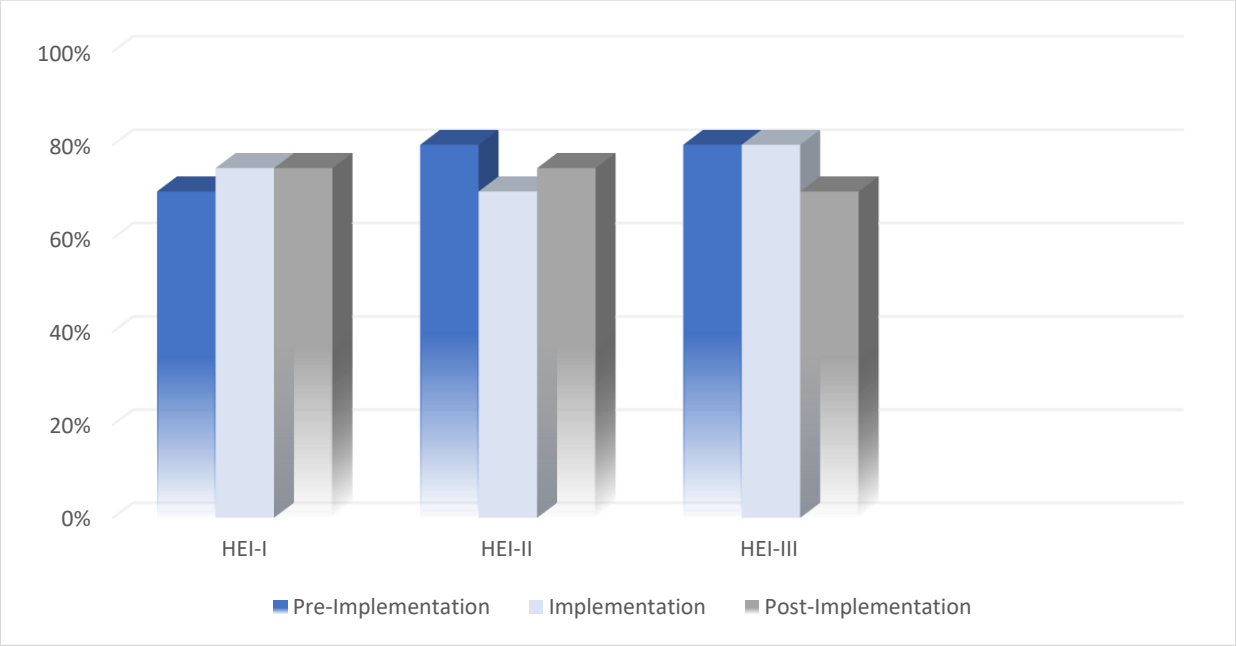

Figure 8. 8 Project Management factor across ERP implementation Lifecycle

For the project factors, the project management was of high importance at all phases. In HEI_II and HEI_III, the implementation of ERP system required some extra efforts and support from the management to make the project successful in the context of educational institutions. Thus, it can be said project management is an important factor during all implementation phases.

❖ **Budget**

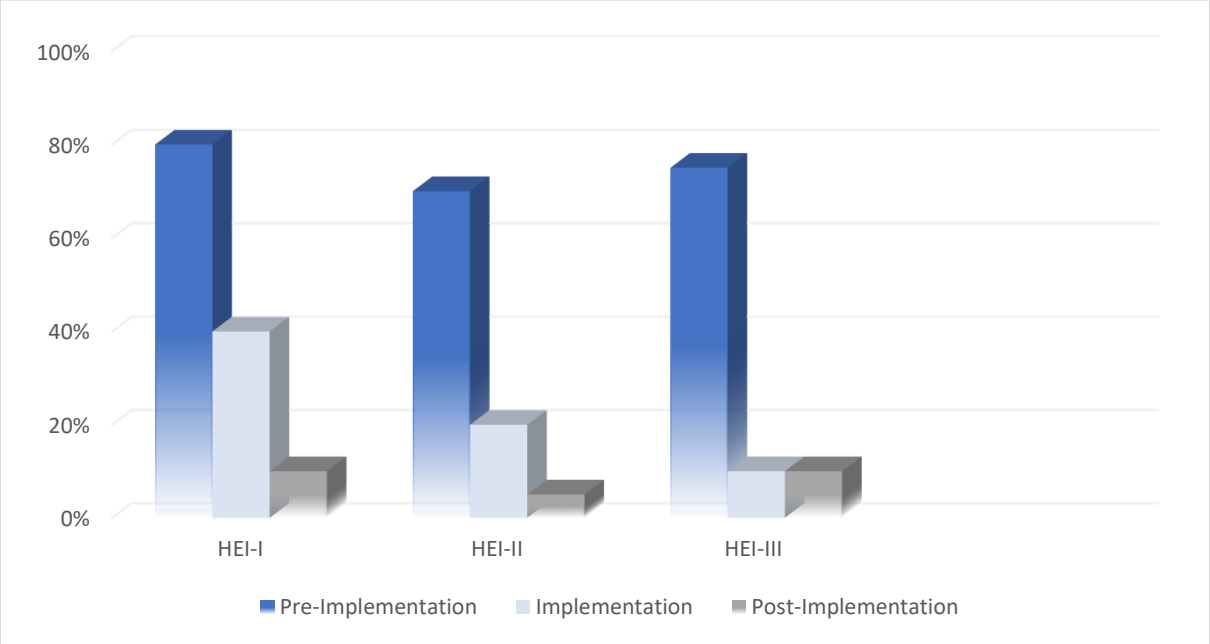

Figure 8. 9 Budget factor across ERP implementation Lifecycle

As per general perception, cost of a system is compared against the benefits of system and in HEI_I, the previously applied bank ERP was already a total failure which had cost a lot to university; therefore for the new ERP system, the comparisons and feasibility assessments were required at pre implementation phase. HEI_II had the funds for Oracle and it has also proved its worth. Thus, it can be said financial resources for ERP implementation is an important factor at pre-implementation phase.

❖ **Time**

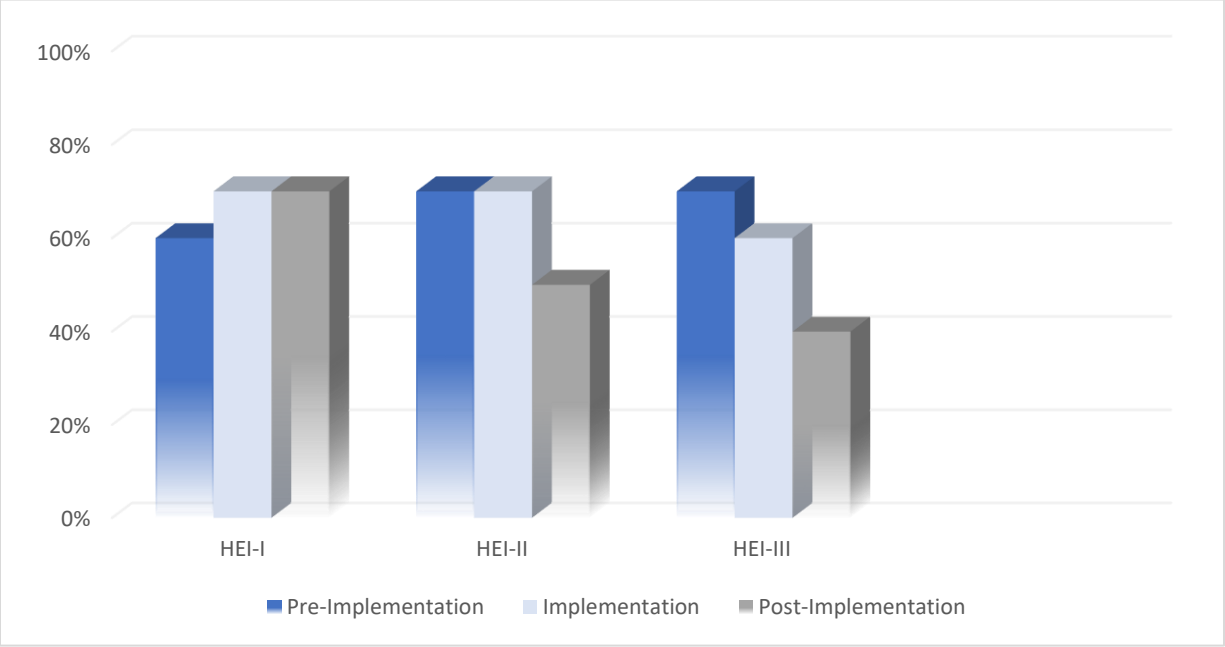

Figure 8. 10 Time factor across ERP implementation Lifecycle

The factor of time was equally important at all phases for all the three universities as all the three universities successfully managed time and completed each phase of the ERP implementation at the proposed time. Thus, it can be said time is an important factor during all implementation phases.

❖ **Right ERP System**

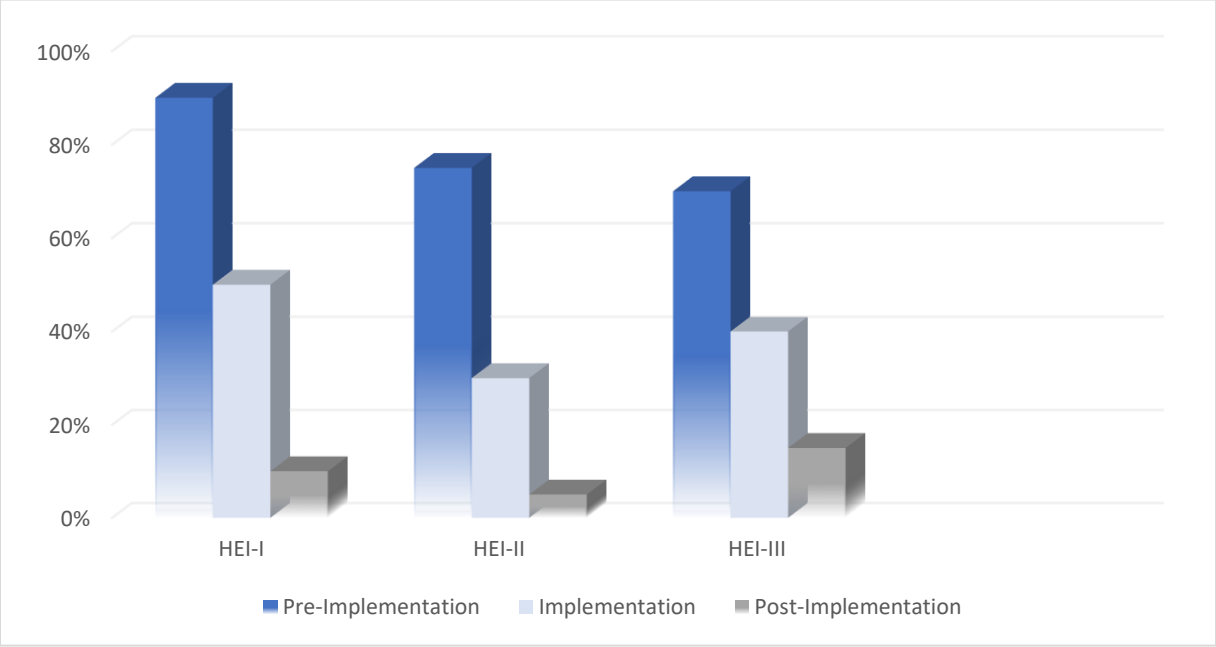

Figure 8. 11 Selection of Right ERP factor across ERP implementation Lifecycle

For HEI_I, selection of right ERP system was the most important factor at pre-implementation phase because they had already implemented a non-appropriate ERP system which was a bank ERP system and was not able to meet the requirements of an educational institution. Hence, the selection of right ERP system was given highest importance at pre implementation and implementation phase of ERP system. For the HEI_II, selection of Oracle as the ERP system was a right decision as per the requirements of their university, hence this factor has not caused any issue to HEI_II at any stage. For HEI_III, SAP is a right choice but the technicalities of the SAP made it difficult to implement at pre implementation phase.

8.4.4 System Support Factors

❖ **Top Management Commitment and Support**

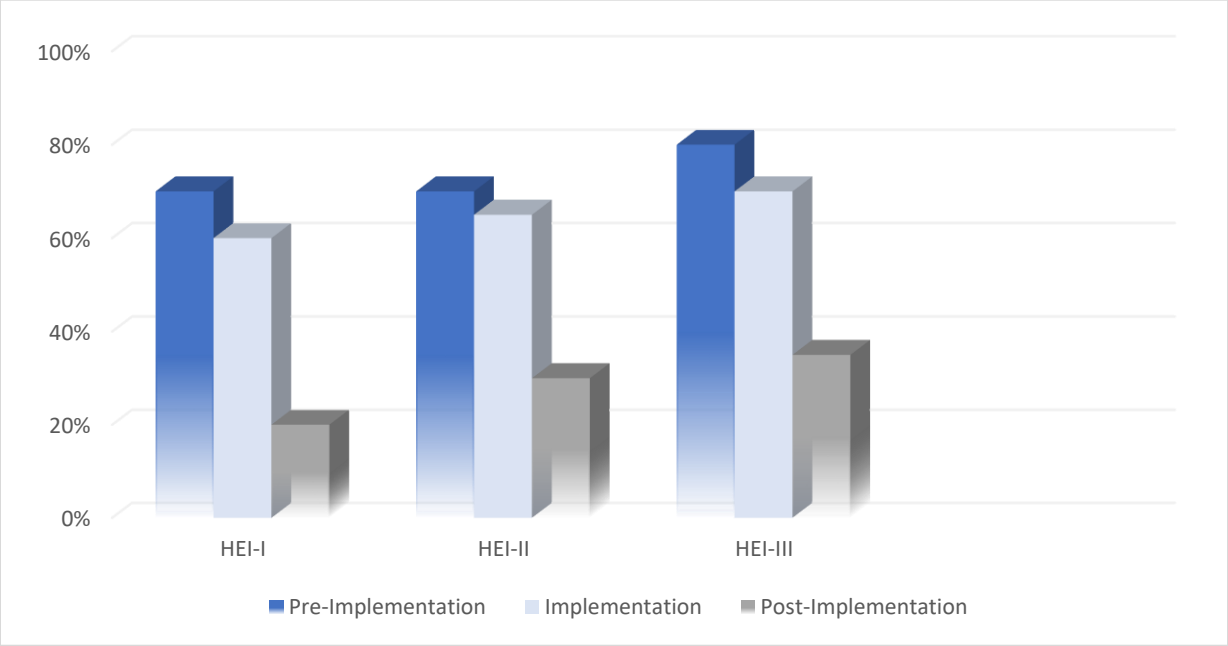

Figure 8. 12 Top Management commitment and support factor across ERP implementation Lifecycle

In case of system support factors, HEI_I had some issues for the top management commitment and support at pre and post implementation phase because the bank has some shares in the university which resulted in some conflict of interests for selection of ERP system and its evaluation. For HEI_II and HEI_III, top management is highly committed and supportive towards the successful implementation of ERP system and its evaluation for achievement of the targets. Thus, it can be said top management is an important factor during pre-implementation and implementation phases.

❖ **Qualified IT Staff**

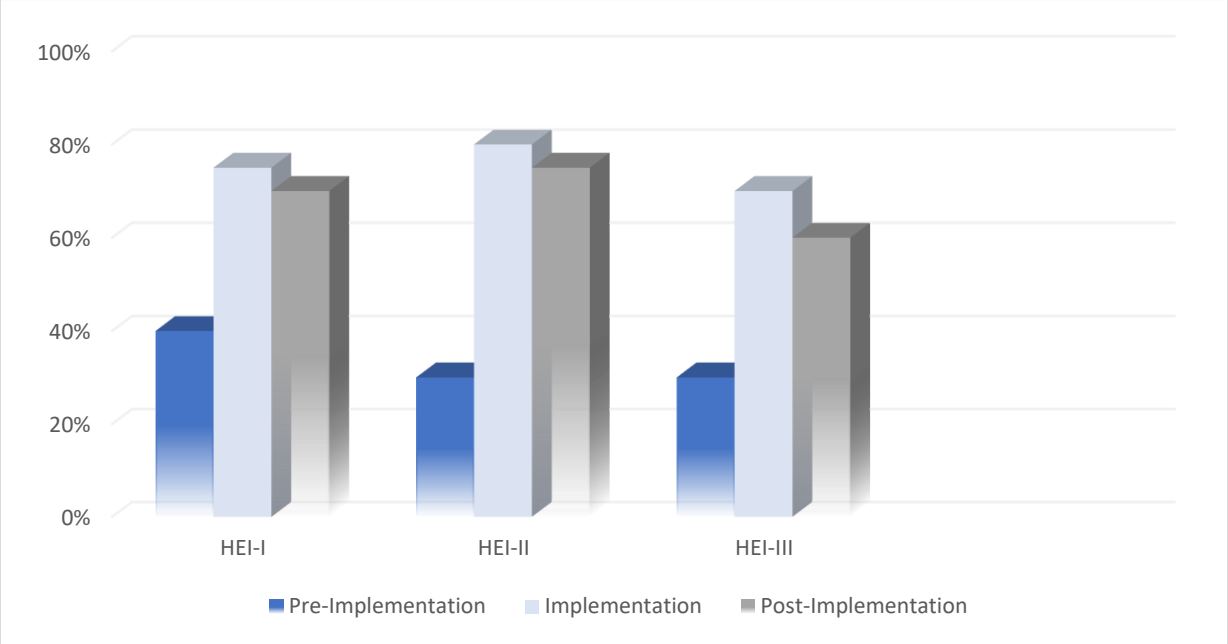

Figure 8. 13 Qualified IT Staff factor across ERP implementation Lifecycle

HEI_I, HEI_II and HEI_III, the provision of qualified IT staff is the most important factor to support the functions and operations of ERP system at implementation and post implementation phase. Thus, it can be said qualified IT staff is an important factor during implementation and post implementation phases.

❖ **Vendor Relations**

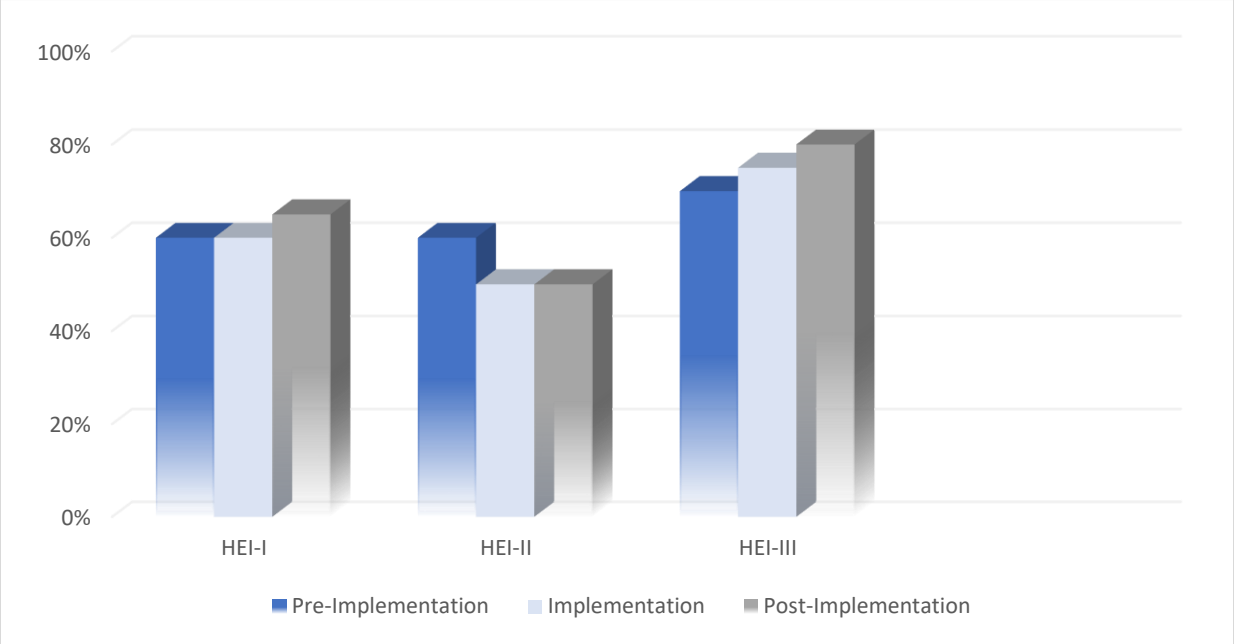

Figure 8. 14 Vendor Relation factor across ERP implementation Lifecycle

For HEI_I, trainings and data migration was done by the vendor hence the relationship with vendor was supportive and of high importance. Similarly for HEI_II, cooperative and supportive relations with vendor are being developed due to which no major issues were reported at any stage. In case of HEI_III, the SAP which has collaborated with the HEI-III for the implementation of ERP system is also the vendor of SAP and this has affected the evaluation at the post implementation phase. Thus, it can be said fair vendor relation is an important factor during all implementation phases.

8.5 Comparison of Issues

This section is addressing those issues which are being faced by the users of the ERP system while using the newly adopted and implemented system while in section (6.4), the challenges faced by the top management and technical level staff in HEI for the implementation of ERP system.

The issues related to the use of ERP system are highlighted and discussed in the light of participant's responses. These issues are identified by the users of the ERP system some of which are related to the ease to use ERP system while others are related to maintenance of ERP system.

For the HEI_I, some organisational and personal issues highlighted by the top management and technical level staff are compatibility of ERP system with university requirements, resistance shown by the staff to adopt the change, issues in system integration, lack of training and education to technical staff members, and poor communication within the educational organisation for the management and administration of ERP system.

For the HEI_II, problems in using ERP system are resistance by staff to adopt the change, maintenance cost of ERP system, integration of operations, compatibility issues, and poor communication.

In case of HEI_III, the most important problems or challenges in using ERP system are resistance shown by the staff members for the adoption of new ERP system, and lack of expertise for the complexities of ERP system.

It is observed that the issue of resistance by the staff members towards the change adaptation is common in all three cases and for HEI_I and HEI_II, issues of maintenance cost, integration and poor communication are also similar whereas for HEI_III, provision of training and education for the gain of expertise to use the complex functions of ERP system are highlighted by the participants.

In case of maintaining the ERP system, HEI_I is facing issues of running expenses, lack of IT support, Lack of Evaluation plans, and purchase of right ERP system through right vendor. While for HEI_II, in-house maintenance expenses, provision of qualified IT staff support and right ERP system selection with vendor assistance are the challenges for the maintenance of ERP system. On the other hand HEI_III has the problem in high maintenance cost and provision of qualified IT

staff support to maintain the successful and effective functioning of ERP system within the organisation.

It has also been analysed that, HEI_I has transferred the information from old ERP system to new ERP system (Microsoft Dynamics) through the assistance of external vendor and there were difficulties faced in this process by the management of HEI_I. While the HEI_II and HEI_III adopted the approach of data migration through proper planning and coordination which has helped successful transfer of information from old information system to new ERP system.

8.6 Chapter Summary

In summarizing, the three case studies of higher education institution which are on HEI_I, HEI_II and HEI_III. The analysis has indicated that the ERP system in HEI_I is not successfully implemented. Hence is causing lots of issues and problems for the users in use of ERP system to achieve the pre-defined goals and objectives set by the management of the university. While the ERP system in HEI_III can neither be classified successful nor a total failure. There are some issues which are being faced by the management and users of ERP system for implementation and use of system in achieving the goals. For the analysis of third case i.e. HEI_II the ERP system is successfully implemented as well as is functioning effectively in improving the performance of HEI through achievement of goals and targets. Comparative analysis of three cases have indicated that there are few factors which are more critical and influential as compared to the other factors for the successful implementation and adoption of ERP system in already operating HEI. These factors were given the highest priority by the participants of the three case studies. These factors are selection of right ERP system, qualified IT staff support, training and education and vendor relations. By examining the comparative analysis of three cases it was witnessed that HEI_I has been struggling with the issue of right ERP system from the beginning. The prevailing ERP system (Microsoft Dynamics) is the second ERP system before which a bank ERP was applied in this educational institution which was a total failure in the context of academics and educational administration functions. Hence the selection of right ERP system at the pre implementation phase is the most influential factor which must be considered by the management of educational institution at the planning stage and such ERP system should be selected which can have the capacity to fulfill the requirements of educational integration and administration. In general it can be said that an ERP system can be successful in one context but it cannot be suitable for another context therefore proper need assessment procedures should be carried out before the selection of any ERP system in any context.

Although, the prevailing ERP system in HEI_II (Oracle) is providing best possible results as per the requirements of the educational institution and it has successfully integrated academics with administrative operations along with the involvement of students but the provision of qualified IT staff support has been highlighted as an important and key factor for the successful operations

of the ERP system. Qualified IT staff support is important at implementation phase as well as at post implementation phase but the analysis has indicated that the non-availability of qualified IT staff support can create big hurdles and issues at post implementation phase because at this stage, the operations and functions of ERP system requires continuous maintenance and technical support from the competent and qualified personnel so that to maximum benefits can be achieved from the successful implementation of ERP system in an academic and educational setting. Provision of qualified IT staff depends upon the training and education provided to the IT staff of the educational institution and their positive response towards the training sessions. For the purpose of improvement in system support facilities through qualified IT staff, on job trainings and extensive courses can be applied by the institutions. This training and education can also be helpful in tackling the issues of resistance shown by the IT staff members of the institution in adoption of new ERP system.

A best quality ERP system has been adopted by the HEI_III which is SAP provided by the German vendors who are also collaborative partners in implementation of ERP system in HEI_III. Another factor which can be generalized through the analysis of comparison is the vendor relation and effect of this relation on the success of ERP system. In generalizing the findings of analysis, it can be said that cost of ERP system being implemented in HEI, it's maintenance after the implementation phase and the evaluation of ERP system performance depends upon the relations of institutions with its vendor. As in case of HEI_III, SAP is an expensive system but its cost was borne by the German organisation which is also responsible for its maintenance. Hence, the HEI_III was not in a position to choose the right ERP system from multiple options which ended up in implementation of a complex and sophisticated system which is not easy to be used by the users of HEI_III.

Therefore it can be said that, educational institutions should consider the following key factors; right ERP system selection as per the requirements of educational setting, training and education of the IT staff to make them understand the complexities and features of ERP system, provision of qualified IT staff support for the in-house maintenance of ERP system and free will in selection of vendor for purchase of right ERP system and cooperative relations for implementation and

maintenance of system for the success of ERP implementation project and achievement of targets.

CHAPTER 9 DISCUSSION AND PROPERSITIONS

9.0 Chapter Overview

The present study aims to increase the success rate of ERP system implementation for higher educational institutions in Jordan. A proposed implementation model for HEIs and particularly those in Jordan will be developed. The research questions defined for the study were:

a) Identification of problems that are being faced by the higher educational sector of Jordan in implementation of ERP system.

b) Identifying and examination of those key factors which are influencing the successful implementation of ERP system in HEIs and why these factors are important and key for the successful implementation.

c) Provision of suggestions in the light of study findings that how an ERP system can be successfully implemented in the higher education sector.

d) Examination of evaluation criteria adopted by the higher education sector for the measurement of success or failure of ERP system.

In order to address and answer these research questions, the study dealt with the following propositions which are:

1) Identification of factors which are influencing the ERP implementation

2) Prioritization of the factors and their importance level for successful implementation of ERP

3) Examination and mapping of the influential factors for the different lifecycle phases and stages of an ERP implementation.

In the previous chapters (Five, Six, and Seven), three case studies have been examined to investigate the factors which lead to a successful ERP implementation. For the generalization of the findings, a comparative analysis of the findings of the case studies has been conducted. The findings from the case studies and the comparative analysis suggested that there is a need for modification of the conceptual framework model which was proposed in figure 3.10 in Chapter

three. Hence, based on these findings, a synthesised model for ERP implementation across all lifecycle phases is presented in this Chapter. The development of this synthesised model is a step towards the achievement of the aim and objectives of the study.

9.1 Review the Structure of Current Study

In the present study one of the objectives was to develop a model which can be adopted by the Jordan HEIs to achieve their implementation goals and targets. The need for an ERP system was discussed in chapter two. The research questions and research objectives were stated in Chapter one. In order to understand the implications of an ERP system implementation in HEIs, the related literature was reviewed in chapter three. This review identified the following issues:

a) Inadequacy of the proposed ERP implementation model in the context of higher educational sector, which is creating a gap between proposed results of ERP and actually achieved results of ERP implementation. These claims have been strongly contested in recent years by a number of writers (Krigsman, 2013; Waring and Skoumpopoulou, 2012; Fryling, 2015). Therefore, the identified synthesised model for ERP implementation across lifecycle phases in section (9.4) fulfilled this essential gap.

b) Much attention has been given in the literature to the factors influencing the success of ERP implementation but very little attention has been paid to the prioritization of these factors, particularly in HEIs (Tarhini et al., 2015c; Orozco et al., 2015; Abbasi et al., 2015). However, this study has identified and investigated and prioritized these influential factors based on the evidence provided by the research participants.

c) There is a lack of empirical research on the mapping of these success factors for different stages of the ERP implementation life cycle (Pilat and Devlin, 2004; Léo and Philippe, 2006; Rai and Sambamurthy, 2006; Ahmad et al., 2007; Ozyilmaz and Berg, 2009; Uwizeyemungu and Raymond, 2011). Consequently, this research has proposed a synthesised model which identifies the success factors for each stage of the ERP Implementation lifecycle.

The proposed model was developed by completing the following steps:

1) Identify the key success factors which influence the decision making process

2) Prioritize these success factors based upon their importance level

3) Consider the stages of the ERP implementation life cycle

4) Map the success factors to the stages of the ERP implementation life cycle.

In chapter four the research methodology being adopted to carry out the study for the achievement of research aims and objectives was presented with proper justification for the decisions taken for the research design. A qualitative case study approach was adopted to answer the research questions. Three universities which had implemented ERP systems were selected as sample case studies the case studies were analysed to extract the empirical findings for the study and were presented in chapters 5, 6 and 7. In chapter 8 a comparative analysis of the case studies was performed to generalize the findings which led to the development of the proposed model.

The findings of the case studies and comparative analysis have identified the following success factors: selection of right ERP system, provision of qualified IT staff for In-House maintenance and the influence of vendor relations for the successful implementation of ERP system.

The ERP implementation life cycle phases and stages are being revised on the basis of empirical findings and new stages were introduced to be investigated further which were: testing at the implementation phase after the stage of implementation, and to go live after the phase of shakedown at the implantation phase.

Finally the conclusions are drawn from the findings of the three case studies which led to the development of a novel model for the implementation of an ERP system for HEIs which can be used as a decision making tool during the investment evaluation process.

9.2 Identified factors in the HE context

Table 9. 1 Identified factors in the HE context

Factor	Link With HE
IT Infrastructure	• As per the needs of ERP software requirements, an updated , upgraded and compatible IT infrastructure is required for the successful implementations and operational working of the ERP system in HEI • HEI activities are departmentalized • Multi Branch HEI connection and e-content accessibility is acquired through updated IT infrastructure
System Quality	• ERP system needs to be custom designed or modified as per the needs of HEI with the best quality performance.
Information Quality	• At the time of implementation, data migration from old system to new ERP system is dependent on how information was secured in old system and also how data migration was done to new ERP system. In case of any manipulation or mishandling of information from old system to new ERP system, the information quality related to the staff and students might get affected.
Change Management	• Familiarization of staff and students with the new ERP system at the time of implementation is necessary as this will minimize the resistance and also maximize the acceptance by the stakeholders. This in longer run can affect the performance of students as well as staff during academic session.
Training and Education	• Staff and students show reluctance at the time of implementation of new system as most of them don't have much experience in handling such systems neither were they previously required to have such experience.
Organisational Culture	• Different HEI have different ethnographical and demographical

	cultures which HEI department of that specific country sets in which a specific HEI falls. In case of clash or lack of support of ERP system to required demographic and ethnographic demands, the ERP system will fail.
Business Process Reengineering	• In an academic setting, different modules have different requirements. So, in order to make an ERP perfect fit for the HEI, along with making system modifications compatible with the processes, some processes also need some changes making process compatible with the system. e.g admission processes, fee scheduling, library maintenance, course work management, staff profile updation etc.
Project Management	• For educational institution, ERP implementation is a side project for the enhancement of its activities. It's not a mandatory obligation for the HEI and many factors affect the successful implementation of ERP like human resource, allocation of resources, funds, etc
Budget	• From the total income of an HEI, allocation of sufficient funds for the purchase, implementation and maintenance of an ERP system is duty of the management and management is accountable for this allocation.
Time	• Essence and good results from implementation of any project can only be achieved by timely implementation of all key components in a timely manner. In case, the implementation is not made in a timely manner; adverse effects may be noticed on activities of both faculty and students.
Right ERP system	• An ERP system cannot be judged as good or bad by its implementation in one particular scenario. A single ERP system can give good results in one context but

	may not be compatible for any educational requirements. So, purchase of right ERP system from right vendor in context of HEI is necessary.
Top Management Commitment and Support	• With streamlined activities, top management of HEI can have an eye on all activities and can make right decisions at the right time. The feedback system can also help top management in making right decisions for each stakeholder's interest to be considered for improved performance and satisfaction.
Qualified IT Staff (In-House Maintenance)	• Maintenance of ERP system is a costly process as development and load management may raise the need for improvement in the system. So, rather than changing the whole system again, an in-house maintenance team should be available. This will reduce the cost as HEI won't have to get the maintenance from external vendor.
Vendor Relation	• Purchase of right ERP from right vendor is necessary and it should be ensured that the relation with the vendor remains unbiased and best option in best interest of the HEI should be kept in mind while selecting the ERP system.

9.2.1 Revised ERP Implementation Factors

The factors which were influential for the implementation of ERP system in higher education sector were categorised as: technical, organisational, project and system support. These factors were identified from a theoretical perspective based on the findings of case studies. Under each category, the respective factors were classified for the purpose of analysis and the interpretation of results. The findings from the case studies revealed that each HEI had its own higher education organisations have classified different categories, factors, phases and stages for the implementation of ERP system. In each case study, the respondents identified the factors which influenced successful implementation in their own HEI and mapped them to their implementation lifecycle stages.

Under the technical category, IT infrastructure, quality of system and information quality were identified as the key success factors. For the organisational category, the factors were change management, training and education, organisational culture and business process reengineering. For the project category project management, budget, and time were the factors identified, but the participants also added a new factor which the selection of the right ERP system. In the analysis of the findings (see chapter six) it was observed that an ERP system might be the best system for one HEI but a total failure for another, this does not mean that the ERP system itself was a failure. However the participants have highlighted it as a factor so it has been proposed in the findings. Under the category of system support, commitment and support by top management, provision of qualified IT staff for in-house maintenance, and vendor relationships were selected as the key success factors. Additionally, the findings of the case studies also identified in-house maintenance by qualified IT staff and bias towards a particular vendor in the selection process for the ERP system as success factors in the project category. If the IT staff involved with maintenance of the ERP system are unqualified, inadequately trained or incompetent then the ongoing performance and cost of the system will be affected. Similarly, any bias towards a particular vendor in the selection process can result in the choice of the wrong ERP system. Both of these additional success factors could affect the final evaluation of the system.

The comparison of evidence from three HEIs in Jordan has provided an in-depth knowledge for the successful implementation of ERP systems in Jordanian HEIs. Thirteen key success factors identified from the systematic literature review were confirmed to be significant by the comparative case studies. These were organizational factors (i.e. training and education, business process reengineering, top management commitment and support, time, right selection of ERP, financial resources, IT infrastructure, and qualified IT staff), technical factors (i.e. information quality, system compatibility, system quality, system maintenance, and vendor relations).

The findings point showed that the respondents of the study were more vulnerable to the organizational and technical pressures exerted by their colleagues and supervisors. As previously discussed (see figure 3.10) the success of ERP implementation needs cooperation and coordination from different departments and personnel within an organization. Additionally, top management can also pressurize its employees to use the system.

The findings of the study confirmed that training and education was an important success factor as the daily tasks of users can be enhanced and improved if suitable training is provided by the organization. Such findings were also observed in other research studies (Gargeya and Brady, 2005; Bajwa and Monney 2004; Aladwani, 2001).

Some of the most common issues highlighted in the study were: the ERP software lacked the functionality to support existing business processes in the HEI; a lack of trained personnel to handle the complexity of the system, a lack of organizational support in terms of change management, and a lack of performance related information for managers. The KSF of business process reengineering had a positive effect on the success of ERP implementation and this was in accordance with the findings of previous studies (Aladwani, 2001; Nah and Delgado, 2006). The KSF for time was considered to be an important success factor which was also supported by previous research studies (Somers and Nelson, 2004; Zhang et al., 2005). In the technical category the most important success factor was information quality. This confirms the assertions made by When the organisational and technical categories were compared, the factors in the organizational category exerted the strongest influence over success. This may be due to the fact that ERP, as an enterprise system, requires a lot of coordination and cooperation among the members of the organizations to make it work.

9.2.2 New Key Success factors Influencing ERP Implementation in Case Studies

The most influential key success factors identified and highlighted in the findings of case studies are being discussed in this section. These new factors were identified as a) Selection of right ERP system b) Qualified IT staff for in-house maintenance and c) Fair relationship with vendors.

- **Selection of Right ERP System**

This specific key success factor was identified in the findings of all three case studies. The participants considered that this factor was most important at the pre-implementation phase under the category of project factors at the time of making decision for purchase of most suitable ERP system as per the requirement of higher education institution. For case study 1 (HEI_I), this specific factor was the most influential and critical for the implementation of ERP system. HEI_I was a private university for which their bank has shares of ownership. The existing ERP system was the second ERP system to be implemented at the university. The previous ERP system, was the system used by the bank who exerted influenced the selection process as a shareholder. According to the interview participants the first system was a total failure because it was unsuitable for an educational institution. Although the ERP system was operating successfully for the bank's operations it was not capable of addressing the needs of an educational institution. After the failure of the first system the HEI adopted the ERP from Microsoft dynamics ERP which is at its post implementation phase. Findings from the case study showed that the failure of the first system was still affecting the acceptance of the new ERP system by the users. The users of the system (Staff and Students are showing a reluctance to accept the system because of their perception that the new ERP system was unsuitable for an educational institution.

For the second case study (HEI_II), the ERP system was considered by the interview participants as suitable which could be because their I.T technical team are responsible for customisation and maintaining the ERP. The findings from the case study identified that; special consideration was given to the selection of the right ERP system to fulfil the requirements of an HEI and the achievement of predetermined goals. Selection of the right ERP system was the most important and critical component of the decision making process at the pre implementation phase while the management of the organization was planning to make the transition to another ERP system.

In case study 3 (HEI_III), the existing ERP system was SAP, a German software product which was being implemented by a German company who was a collaborating partner with the university. The company was funding the implementation of the system and selected SAP for the university. Although SAP was one of the best ERP systems the findings have indicated that it is more complex and sophisticated than expected by the users. Due to the complexity and technicalities of SAP, the users of the ERP system, are showing a reluctance to accept SAP and its use for academic as well as administrative functions. The ERP system was considered to be unsuitable because of it was complex and difficult to use by the staff members of university and this has also fact has adversely affected their satisfaction with the training sessions they have received.

- **Qualified IT Staff for In-House Maintenance**

Another key success factor explored in the present study was the availability of qualified IT staff for the in-house maintenance of the ERP system at the post implementation phase. In case study 1 (HEI_I), the university were in the process of replacing the first ERP system. The IT staff of the university were not willing at first to accept the ERP system because they found it unsuited to their needs. This had delayed essential training and knowledge transfer required to use the system. The staff were also reluctant to adopt and use the replacement system because of their experiences with the previous system. According to the interview sessions, the availability of qualified I.T staff was also important at the implementation phase to implement all the modules of the system in accordance with the standardized procedures and protocols of the IT function.
For the second case study (HEI_II), the provision of qualified IT staff for in-house maintenance of ERP system was the most important factor for the successful implementation of the ERP system. The availability of competent qualified IT staff are needed to reduce the maintenance cost of an ERP system which can be a big issue if it is not provided by the vendor. Therefore, contingency plans are required to be made to reduce the ongoing maintenance costs. Furthermore, the qualified IT staff can pass on their expertise by training the other staff in the IT function to improve the performance and utilization of the system.

In case study 3 (HEI_III), Ongoing maintenance was provided by the German company as part of the contract for managing the ERP system. The participants in the interview sessions raised the

issue that would occur if this maintenance had to be provided in-house because of the high cost of training for existing staff to maintain a complex system. Training sessions should be interactive and activity oriented to familiarize the users with the different features and operations of the ERP system.

- **Vendor Relation**

The findings from the three case studies showed that the vendor of the ERP system is most commonly responsible for the data transfer, mandatory training, and to some extent, the evaluation of the ERP system. Selection of the right vendor is as important as selection of the right ERP system.

In case study 1 (HEI_I), the previously failed bank ERP system was selected because of pressure from an influential stakeholder. In this case neither the requirements of the educational institution or the capabilities of vendor were properly considered. The ERP system used by the bank was adopted without any customization, and the university was forced to to try and make an unsuitable system fit the needs of an HEI. The vendor was responsible for the maintenance of the replacement ERP system which removed a big responsibility from the university. Therefore, this example shows that in order to select the right ERP system; importance should also be given to choice of vendor.

In case study 2 (HEI_II), a right ERP system had been implemented by the institution with the help of right vendor. According to the responses of case study 2 participants, the vendor of ERP system had performed an efficient and successful handover of the system to the qualified in-house IT staff. That is probably why the interview participants put the factor of in-house maintenance by qualified I.T staff as most important at the post implementation phase.

For case study 3 (HEI_III), there was some biasness and partiality in the vendor partnership with the HEI. The interview sessions showed that the company responsible for the implementation influenced the selection decision for the ERP system. A system was chosen which was complex and difficult to use and was the preference of the implementing company rather than the HEI who did not have the specialist knowledge required to make the decision. This example shows

that if the selection of the vendor is not impartial or is biased towards a vendor for reasons other than the requirements of the educational institution within the limits of its available resources then the wrong choice could be made.

9.3 Proposed ERP Implementation Lifecycle (Phases-Stages) Model

The review of the literature and the responses of the study participants identified three phases for the implementation of an ERP system in an organisation. These are the pre-implementation, implementation and post-implementation phase. These three phases made the distinctions between the planning and start of the project, the launch with available resources and the evaluation and review mechanism. The findings from the case studies illustrated that each HEI had followed the pre-defined approach provided in the literature for the implementation of an ERP system. All of the case studies followed the same structure of phases and stages for the implementation of the ERP system therefore no new life cycle phases or stages were identified. According to the findings of the case studies, the highest priorities for the implementation of ERP system were operational efficiency, financial benefits, and human capital development. The six stages identified and assessed for the case study activities are described in the following chapter

9.3.1 Pre Implementation Phase

- **Initiation Stage**

This stage of the ERP implementation is comprised of need assessments, feasibility studies, base line surveys, capital resource availabilities and allocations, and approval by top management of the budget for the adoption of the new ERP system. Decisions are taken for the selection of supplier, ERP system, project team, and funds allocations. The stakeholders from the top hierarchy are included in the decision making process, who are normally heads of IT, HR and other operational departments. Potential suppliers are evaluated and consultants are approached to get advice for ERP specifications, packages and vendors (Sudevan, Bhasi and Pramod, 2014).

In case study 1 (HEI_I), the findings revealed that less importance was given to need assessments and ERP specifications with their ERP system. The second ERP was much better planned and needs analysis had been performed. According to the feedback of respondents, difficulty were experienced when customizing the ERP system to incorporate the changes required by the

educational institution and end users. This lack of customization was evident throughout the whole process of the ERP implementation.

For case study 2 (HEI_II), a needs assessment, resources were made available and top management support was provided at this stage. Hence, the decision makers were in a better position to decide on the ERP system which was best suited to the requirements of the educational institution.

For case study 3 (HEI_III), the feasibility study and base line surveys were conducted by compant who implemented the ERP system. It is worth noting that the university infrastructure was newly constructed therefore the need to updated IT infrastructure was not an issue for this HEI in the pre implementation phase.

- **Adoption Stage**

The adoption stage is considered as the link between actual implementation and the decisions taken at the initiation stage. At this stage, the strategy for implementation is decided by top management and the choice as which approach will be adopted to actually incorporate the ERP modules into their business operations. Therefore, this stage is also termed the acquisition or approach stage by some scholars (Ravindrakumar Rajput et al., 2015). From the findings of case study 1 (HEI_I) it was concluded that HEIs adopted the big bang approach, implementing all the ERP modules in all departments at the same time. In this case proper planning and resource allocation was lacking, causing issues for the acceptance and use of the new system by the staff of institution.

For case study 2 (HEI_II), a phased roll out strategy was adopted in which a step by step implementation of ERP modules was carried out which was spread over a period of time. For each module time was allowed for acceptance by the users and for the proper functioning and blending of the module within the university operations. According to the feedback of the participants, the phased roll out approach was time consuming but was more effective in familiarizing the users with ERP functions as well as gaining acceptance by the users of the new system.

In case of (HEI_III), the big bang approach was preferred but the staff members of the institute were not mentally prepared for the adoption of the new ERP system which caused resistance from users and a lack of enthusiasm to make the implementation successful.

9.3.2 Implementation Phase

- **Implementation Stage**

At this stage of the ERP implementation lifecycle, the actual use of ERP for the organisational functions and processes takes place and then real time issues are observed by management as well as the users of the ERP system. This stage of the ERP implementation is categorized into installation, configuration and testing, design, reengineering, and setup (Supramaniam, Abdullah and Ponnan, 2014). Resistance by the users is most evident at this stage and their needs should be dealt with at the earliest opportunity.. If change management problems and conflicts are not resolved at this stage then the risk of non-utilization of the system will increase in the following stages. (Murphy, Chang and Unsworth, 2012). From the findings of the case studies, it was observed that similar activities were adopted at this stage by all the selected HEIs. The only difference was that students were involved in case study 2 (HEI_II) and case study 3 (HEI_III) but not in case study 1 (HEI_I), which affected end user satisfaction in the following stages.
In case study 1 (HEI_I), the implementation involved the participation of vendor, top management and IT staff but students were neither trained to use the system or their feedback catered for in future decision making. Additionally, in all the case studies there were issues with the integration of the ERP with the other information systems and operations which were not catered for properly at the implementation stage.

In he second case study (HEI_II), the implementation stage was well managed and students were given an important role in the implementation. The integration of the academic operations with the modules of ERP system was carried out in a properly organised step-wise manner by a phased roll out approach which made the ERP system more compatible and user friendly.

For the case study 3 (HEI_III), the ERP system was implemented to integrate finance, human resources, inventory, and student information / management with specific e-learning and e-content managed through portals. Students were encouraged and motivated to learn and use the system in their academic activities which prepared them for the demands of the labour market.

❖ **Shake Down Stage**

At this stage of the ERP implementation lifecycle, final steps are being carried out to fully implement the ERP system within the processes of the organization. At this stage, less issues of resistance, reluctance towards training, and organisational inertia will be witnessed. This stage facilitates the overall evolution cycle of the ERP system and it streamlines the business processes by the routine use of the system for operational activities (Kumar and Shivashankar, 2017). This stage exposes the system to risk factors related to stakeholders and technical and operational capabilities which could lead to success or failure depending on how they are managed.

For case study 1 (HEI_I), a second ERP system has been implemented and is in the post implementation phase however the shortcomings and pitfalls at the shakedown stage were not dealt accordingly. Furthermore, the HEI had issues related to system support and stability which should have been pilot tested earlier.

In case study 2 (HEI_II), during the phased roll out activities like testing and go live were also included in the implementation phase for some modules of the ERP system. All of the modules were not implemented at the same time, instead, some of the modules were fully implemented and then tested so that the users could identify any problems. Similarly steps were taken for some modules to go live to assess discrepancies and whether any modifications were needed to the compatibility and utility of the system.

In case study 3 (HEI_III), activities like customization and modification were considered at this stage but the complexity and sophistication of the SAP software was not given any extra attention or additional training sessions to motivate the users. This in return affected the overall utilization of the system and its performance evaluation by the end users.

9.3.3 Post Implementation Phase

❖ **Evolution Stage**

Main activities involved in this stage are concerned with the enhancement of the usual business operations and installation of monitoring and control mechanisms which can be used to track the errors or mistakes and ultimately help in the decision making process. In this stage of the ERP implementation lifecycle, the measurement criteria are identified and can be modified according to the requirements of the HEI. Maintenance, provision of technical support, and comparisons of costs are carried out to evolve the ERP system for the achievement of pre-defined targets (Ganesh and Mehta, 2016).

In case study 1 (HEI_I), the educational institution was struggling to evolve the ERP system according to the needs and requirements of the users. The ERP system for this HEI is merely a desktop application and is not web based making it more difficult to provide interactive facilities to users for their academic and administrative tasks.

In case study 2 (HEI_II), the ERP system has evolved to facilitate the web based integrated activities for administrative and academic tasks. In the evolution process, the ERP system has been enabled to perform the tasks of online registration and payment, attendance maintenance, and assessment and grading.

For case study 3 (HEI_III), SAP is a most secure ERP system giving a high priority to data protection but the complications and sophistications of the system are limiting its use. In order to address this issue, educational courses and training sessions are being given to users to motivate them to learn more about the system so that they willuse it more.

❖ **Optimization Stage**

At this stage of the ERP implementation life cycle, the overall performance and business outcomes of the system are assessed with the help of continuous monitoring. ERP performance is evaluated against the targeted benefits for the HEIs. This can help top management make the

decisions necessary to optimise the business processes in terms of resources, satisfaction of stakeholders and improvements in performance.
In case study 1 (HEI_I), the optimization has not been achieved as the educational organisation was not successful in evolution stage.

For case study 2 (HEI_II), activities like extensive training, recruitment of qualified IT staff and provision of in-house maintenance were being streamlined for maximum utilization of the ERP system and to carry out the optimization.

In case study 3 (HEI_III), monitoring and control mechanisms were in progress to be deployed to cater for the short and long term change requests from users.

In summary, it can be inferred that educational institution one (HEI_I) has made some errors at the implementation and pre-implementation phase which still have not been rectified at the post-implementation phase. While the second educational institution (HEI_II), adopted the ERP system in a more detailed and step-wise manner by adding the testing and go live stages in the implementation phase which was helpful for the successful implementation of ERP system. Similarly, educational institution three (HEI_III), also considered some steps for additional evolution and optimization stages. However, the complexities of the ERP implementation project and number of activities in the implementation phase demanded a further division of the two testing and go live stages of the implementation phase. Therefore, the modified conceptual framework for the ERP implementation life cycle phases will have a total of eight stages as described below:

Pre Implementation phase - Initiation stage and adoption stage

Implementation phase - Implementation stage, testing stage, shakedown stage and go live stage.

Post Implementation phase - Evolution stage and optimization stage

The proposed ERP implementation lifecycle (phases-stages) model is presented in figure 9.1.

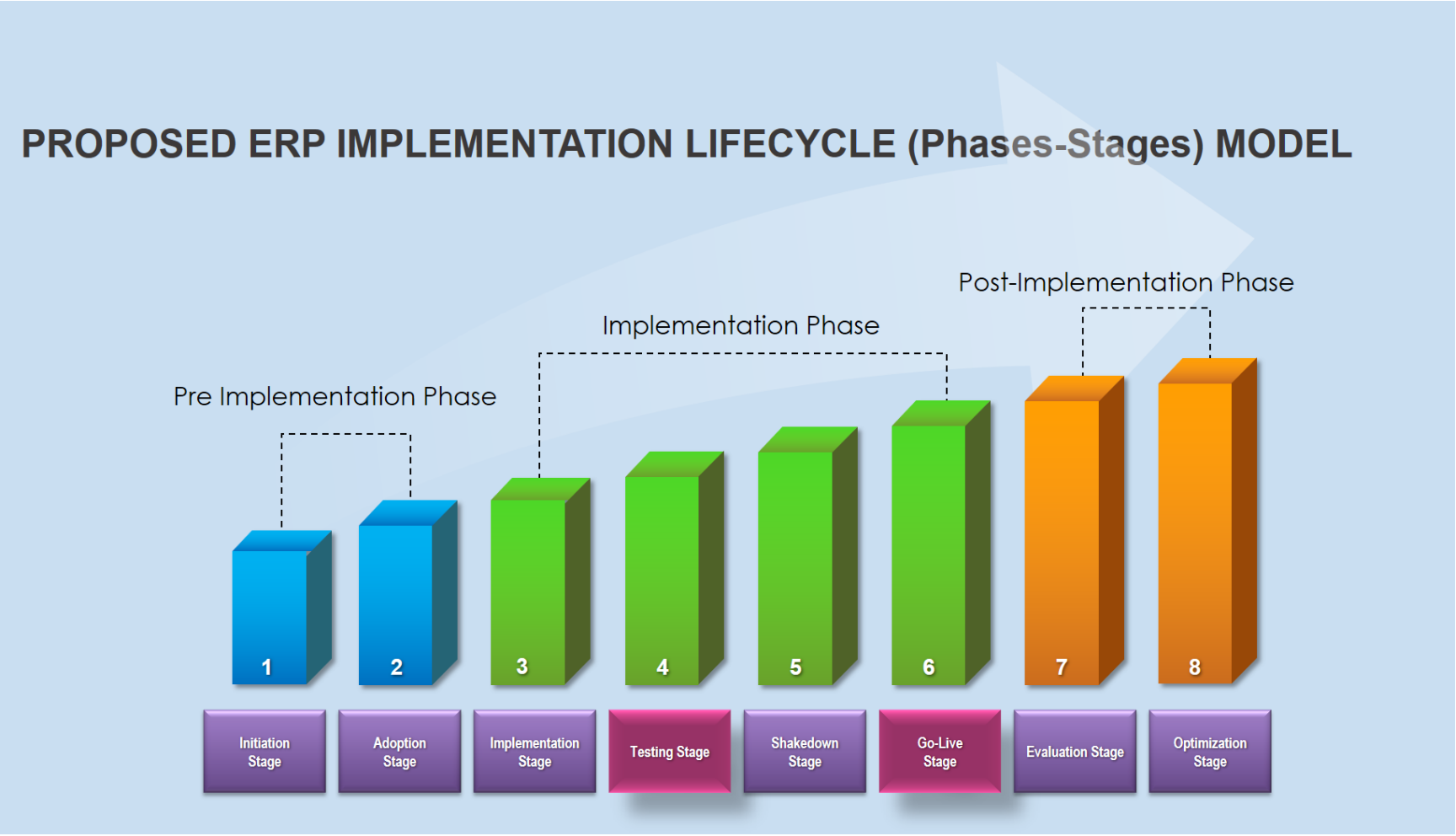

Figure 9. 1 Proposed ERP Implementation Lifecycle (Phases-Stages) Model

9.3.4 New ERP Implementation Lifecycle Stages

From the findings of the case studies the researcher has identified new stages in the ERP implementation lifecycle for HEIs in the implementation phase these new stages are discussed below:

- **Testing Stage**

The comparative findings of the three case studies highlighted a need for an additional stage after the implementation of ERP modules in the business operations.

In case study 1 (HEI_I), a testing stage was not introduced in the implementation phase as all the modules of the ERP system were implemented in all departments at the same time. This minimized the chances of error detection and modification of change management strategies to evolve the ERP system according to the requirements of users and the implementing organisation.

In case study 2 (HEI_II), all of the participants were of the opinion that the system should pass through some sort of thorough testing process after the attainment of the required functionality. This testing process would ensure the proper functioning of the system as anticipated in the ERP design documentation. Because of this the HEI adopted the new stage of testing which helped in identifying errors, inaccuracies and deficiencies before the shakedown and go live stages.

The testing stage comprised of departmental testing, system testing, dry run data conversion testing, integration testing, administrative operations testing, online accessibility testing, user acceptance testing, security testing and performance testing.

In case study 3 HEI_III), the testing stage was not properly identified and managed so it was suggested that to test compatibility and usability, and recognising the sophistication and complexity of the system, a system quality testing stage should be included. Also because of the difficulty in use, lack of sufficient training sessions, resistance of users, and their reluctance to adopt the system, that a preliminary acceptance testing stage should be included. Both of these stages were then added to the post implementation phase.

- **Go Live Stage**

This stage was identified by the researcher as an important and applicable stage within the implementation phase after the shakedown stage. The sequence of stages proposed in the

implementation phase are the: implementation stage, testing stage, shake down stage and go live stage. The go live stage is also a type of testing stage which is a final preparation stage before actually going fully live with the system.

In case study 1(HEI_I), the implemented ERP system did not have the features for web based live operations. Hence the overall integration of the systems had gaps which affected the real time activities and optimization of the system. The testing and go live stages were important to make implementation successful and reap the maximum benefits out of the system.

In case study 2 (HEI_II), institution deployed the go live stage for few modules of the ERP system to test compatibility before handing over the system to users. Five steps were involved in the go live stage which were: data migration cut over testing, user training, and system management, cut over activities, and finally cut over. By following these steps, a systematic and gradual approach was adopted to make the transition from the old legacy system to the newly implemented ERP system. The Go live stage helped the organisation to modify the applications within the system according to the needs of users and this customization helped to tackle the issue of resistance shown by the users in accepting the new ERP system for their daily operations.

In case study 3 (HEI_III), the needs analysis was performed in the post implementation phase to make the necessary adjustments to the system as well as enhancing user acceptance through proper training and motivation. Students were encouraged to opt for the training courses for improved understanding and utilisation of the system during their courses of study. As well as the educational needs of the students being met by training the practical needs were also met by giving them workplace experience with the ERP system.

The Go live phase identified the issues of user training, the vendor's influence on the selection of ERP system, and provisions for in-house maintenance of the ERP system in educational institutions.

9.4 Proposed Lifecycle Model for ERP Implementation

A conceptual framework was presented in chapter 3 which was tested through three selective case studies. The secondary and primary data from the case studies assessed the theoretical propositions and the empirical findings from the case studies have been discussed in the light of literature and case study evidence. For each case study, the most important key success factors

for each phase of the ERP implementation life cycle were identified. The results of the case studies emphasized the need for a model to make the implementation more effective and applicable for educational institutions in future. Chapter 8 presented the influential factors and priotitized them for each case study These factors were then mapped across the ERP implementation life cycle phases and stages based on the findings from the case studies. The prioritization is shown in table 8.4. For the three case studies, two reasons were similar for the adoption of the ERP system which were overall business improvement and integration, while the individual specific reasons were: planning and control of inventory, interactions (case study 1); utility (case study 2) and E-Learning facilities (case study 3).

For the adoption of the ERP system, case study 1 and case study 3 followed the big bang approach while case study 2 used the phased roll out strategy. Similar factor head categories and individual factors under each category are prioritized and mapped for each of the case study. The three most important factors highlighted in the refined conceptual framework are the selection of the right ERP system, qualified IT staff for in-house maintenance and fair vendor relations for the successful implementation of ERP system. The micro view of the ERP implementation phases identified the need for two new stages to be adopted at the implementation phase. These stages were testing and go live which are indicated in figure 9.2. The refined conceptual framework for the successful implementation of ERP system in higher education institution is as follows:

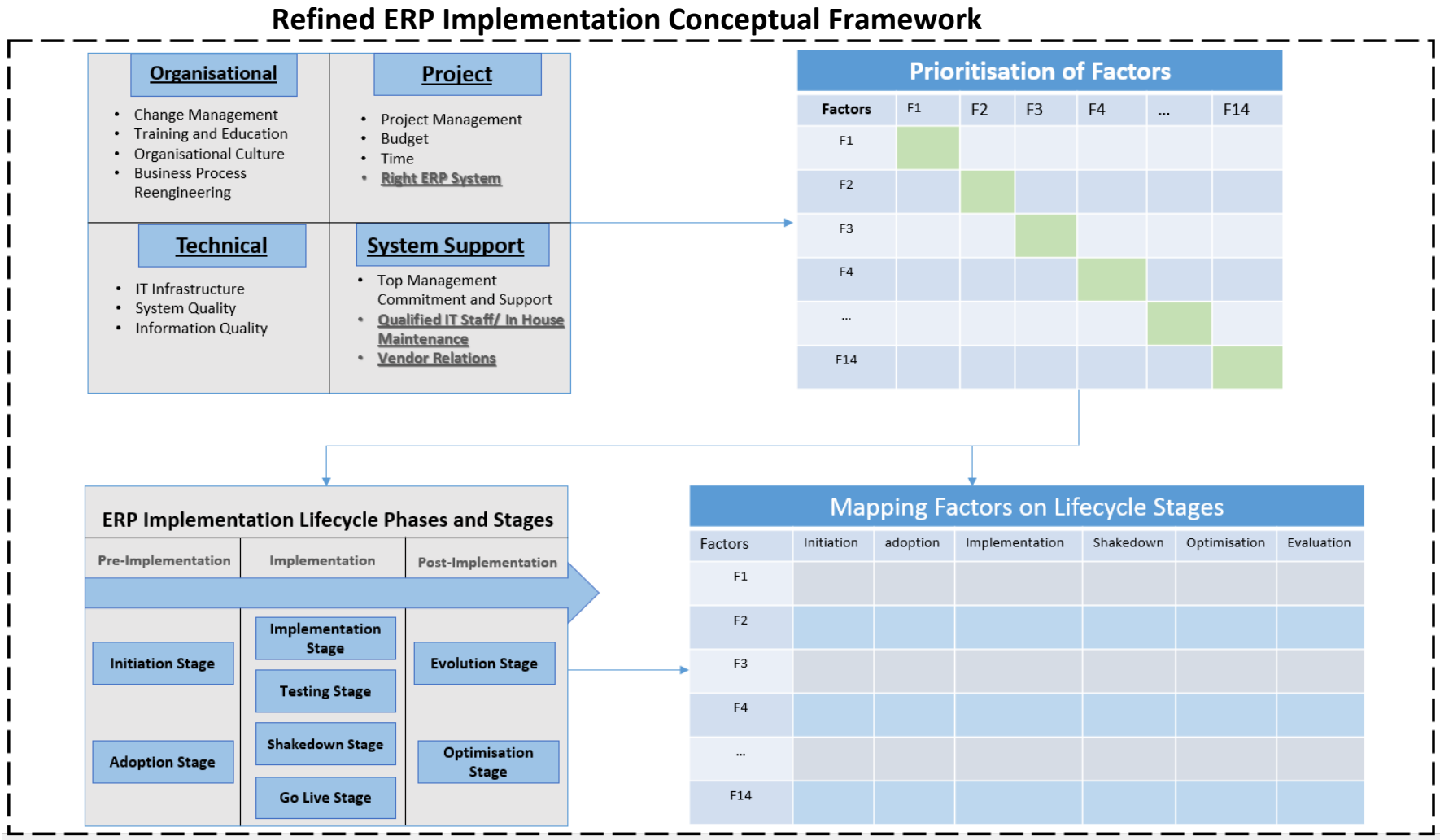

Figure 9. 2 Synthesised Model for ERP Implementation across Lifecycle Phases

It can be observed from the refined conceptual framework; that three important influential factors have been identified under the heads of project factors and system support factors. The selection of the right ERP system has emerged as an influential project factor whereas qualified IT staff for in-house maintenance and fair vendor relations have been highlighted as important system support factors. The proposed model for ERP implementation success has also provided a new measurement tool for the evaluation of ERP performance in an academic institution. The existing measurement tools were user satisfaction, business performance improvement and organisational impact. Whereas, the perceptions and opinions of individuals, either as part of the strategic decision making process or the implementation of technical support, are also emphasised as an important and valid measuring instrument for the evaluation of ERP performance.

In the three case studies, the perceptions and individual opinions of top management participants and technical level participants differed for the measurement of success or failure of ERP implementation.

The findings of the three case studies provided the basis for the mapping of factors on the phases of the ERP implementation lifecycle. This mapping was based on the responses and feedback of the participants from the three case studies and the comparative analysis of these findings. The mapping of the influential factors is provided in figure 9.3 below:

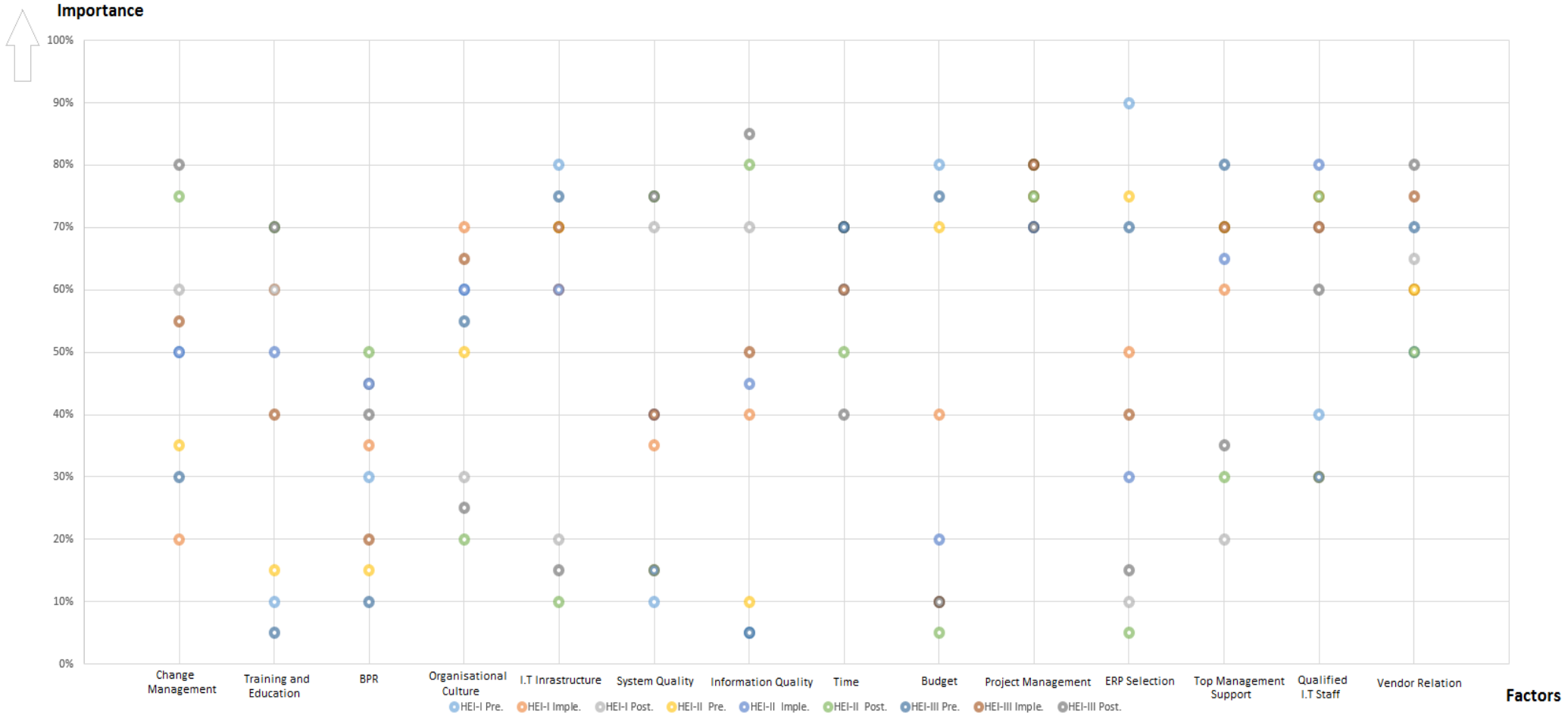

Figure 9. 3 Mapping of the Influential Factors on the ERP Implementation Lifecycle

The mapping chart represents the importance of each influential factor at each phase of the ERP implementation for each of the three case studies. For the purpose of graphical representation case studies and implementation phases are on the y-axis and on the x-axis the priority ranking has been represented in numerical figures. For low ranking factors, a frequency of one (1) is given, while for medium rank factor, a frequency level of three (3) is provided and for the factors which are ranked high, a ranking of five (5) is given whereas for a few factors, the highest ranking of seven (7) in respect of frequency is allocated. Under the four factor head categories, there were fourteen individual factors which are presented with different colour schemes for visual understanding and clarity. It can be observed from the mapping that each factor has been prioritized for each phase of the ERP implementation in respect of its ranking frequency.

For further generalization of the empirical findings extracted from the three case studies, a general mapping of each factor for each implementation phase was completed so that any HEI when adopting an ERP system can consult the mapping framework for the prioritization of each factor at different implementation phases.

The graphical representation of the mapping is presenting the importance of each factor on the basis of its ranking at each implementation phase of ERP system, the information being taken from the case studies of three HEIs. The implementation phases for the ERP system are presented in three different colours on bars. Whereas the fourteen bars represent the fourteen influential success factors. The generalized mapping is based upon the calculation for each factor of the average frequency from the three case studies for each factor separately. The generalized mapping will be helpful for the universities adopting an ERP system and can serve as a guideline for their implementation strategy.

The empirical findings from the three case studies and the generalized comparative findings have identified the role and importance of each factor within each ERP implementation lifecycle phase for the success of an ERP implementation. It is assumed that the proposed models for ERP implementation success and the ERP implementation lifecycle (phases-stages) model will be helpful in improving the

success rate of ERP implementations in HEIs. The mapping of the factors with the lifecycle phases will define the strategic pathway to be followed by HEIs to provide more informed decisions for the adoption and implementation of ERP system.

9.5 Proposed model for ERP Implementation in Higher Education Sector

The conceptual framework model for ERP implementation in higher education sector has been modified and refined as per the findings of three case studies of HEIs. The refined conceptual model has incorporated the key success factors which have been highlighted in the case study findings and these factors have influenced the successful implementation of ERP system in the selected HEIs, therefore special attention needs to be given to these factors.

By summarizing these factors, it can be concluded that the selection of the right ERP system as an influential and critical project factor should be given much attention before the purchase of an ERP system for any educational institution. An ERP system can be the best solution for one scenario but can be a total failure and disaster in another. The wrong ERP system cannot be implemented successfully and the set targets will not be achieved by such a system. However, the purchase and implementation of the right ERP system depends upon the partnership of the institution with the system vendor. A fair and impartial relationships between the vendor and buyer can lead towards better decisions for the achievement of pre-defined goals and targets. In order to adopt and implement an ERP system in an educational institution, proper training and knowledge transfer for users is required for the maximum utilization of the system. Training can also be helpful in reducing the resistance from users faced management during the acceptance stage for a new system. Furthermore, an ERP system requires continuous maintenance and follow ups for its effective operation and functioning and for this purpose; educational institutions should have qualified in-house IT staff to support the system. Otherwise, the maintenance cost and running expenses for the system can become a heavy burden for institutions. Figure 9.5 presents all the factors influencing an ERP implementation.

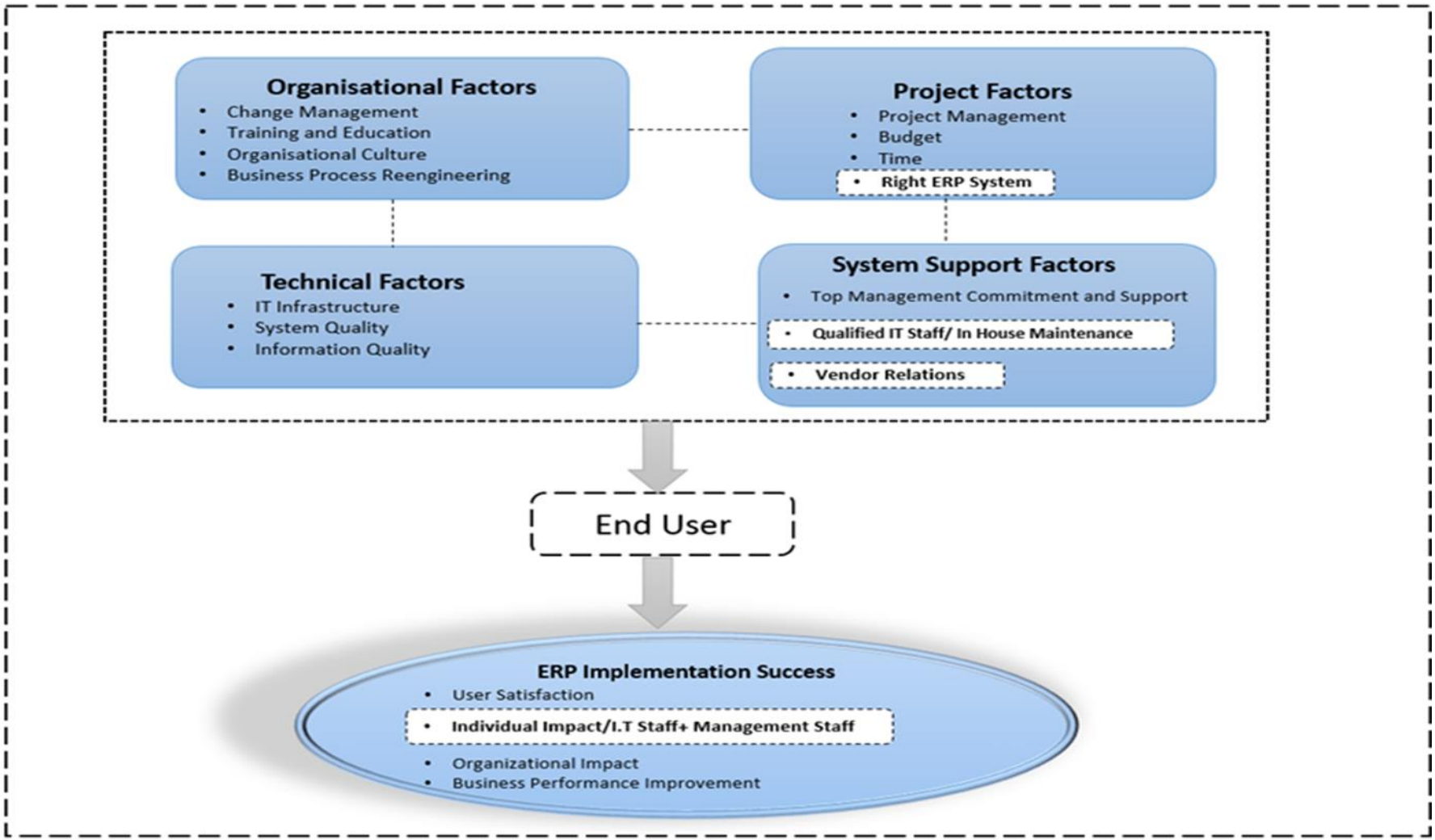

Figure 9. 4 Factors Influencing ERP Implementation

9.6 Chapter Summary

This chapter discussed the research findings for KSFs in the HEIs (Section 9.2); and proposed the KSFs model for the ERP implementation life cycle phases, and the ERP performance evaluation model (Section 9.5). The empirical findings of the three case studies identified three new influential KSFs which were selection of the right ERP system, qualified in-house IT staff for maintenance, and good vendor relations for the successful implementation of ERP system in any educational institution.

In the case of the ERP implementation lifecycle phases and stages, two new stages have been proposed at the implementation phase to address the complexities and large number of activities at this phase. These new stages are testing and go live and they should be part of the implementation phase. Therefore, the proposed implementation lifecycle phase now consists of initiation, adoption, implementation, testing, shake down, go live, evolution and optimization.

According to the investigation and responses of the participants from all three selected higher education institutions, four factor categories are presented for the ERP implementation model and these categories are a) technical b) organisational c) project and d) system support. The grouping of individual factors under each category head is presented below:

- Technical Factors: IT Infrastructure, System Quality And Information Quality
- Organisational Factors: Change Management, Training and Education, Organisational Culture and Business Process Reengineering.
- Project Factors: Project Management; Budget; Time and Right ERP System.
- System Support Factors: Top Management Commitment and Support, Qualified IT Staff (In-House Maintenance) and Vendor Relations.

All of these key success factors are important for effective decision making during the adoption of ERP system in an educational institution. These influential factors and their priority within the ERP implementation life cycle were highlighted by the participants of the case studies. This led to the analysis and extraction of empirical findings for the present study.

The novelty and the contribution to knowledge of the model for ERP Implementation success is demonstrated by:

- The model identifies several influential factors for the successful implementation of an ERP system and these factors should be given special attention when implementing an ERP system in a higher educational institution.
- The model has also identified different phases and stages of ERP implementation lifecycle and all of participants provided evidence that the identified phases and stages were followed by case studies while adopting and implementing ERP systems in their own higher education institutions.

The information provided by this model will be helpful for the higher education sector when making decisions for the adoption and implementation of ERP systems in higher education institutions.

CHAPTER 10 CONCLUSION

10.0 Chapter Overview

In the previous chapters the justification for the research context has been presented in chapters 2, a proposed conceptual framework was provided for the implementation of a ERP system in higher education institution in chapter 3, chapter 4 presented the research methodology which was adopted to carry out the study together with the justification for the approach taken, chapters 5,6 and 7 presented the analysis and empirical findings from the evidence provided from the case studies of 3 HEIs in Jordan, Chapter 8 presented a comparative analysis of the empirical findings for all three case studies based on the similarities and differences between them, and chapter 9 presented a synthesised model for the implementation of ERP in HEIs focussing on all the lifecycle phases.

In the previous chapter, key success factors which influenced the implementation of ERP systems in higher education institutions were revised on the basis of the empirical findings from the case studies. Also, the addition of two new stages in the ERP implementation lifecycle were discussed. The current chapter summarises the overall findings of the research work in accordance with the results and findings from three case studies. Also, this chapter will present: the key scholarly contributions made by the work, the limitations of the study to understand the prevailing scenarios more accurately, the implications and usefulness of the research work, and suggestions for future research.

10.1 Overview of Research Objectives

The basic aim of this research thesis was increasing the success rates for the implementation of ERP systems in higher educational institutions together with the identification of the influential success factors for the different phases of the ERP implementation lifecycle. It was highlighted in the review of related literature that ERP systems have been used in different sectors for the improvement of business processes and as a solution to operational problems. A number of automated information systems are available from the marketplace as an off the shelf purchase and facilities for customization are also provided according to the needs of organisations. In the higher education sector, ERP systems are employed to integrate the operational activities of the academic institutions which have their own set of requirements and pre-defined targets. A variety of ERP systems are being employed by different HEIs but

the requirements for each institution vary, therefore research continues for better solutions to overcome the existing problems and issues in the academic setting. Over the past few years, HEIs have benefitted from the successful implementation of ERP systems for the improvement of overall business performance and achievement of targets.

The best available solution is sought out by institution to optimise results and achievements. The aim of this research work was to increasing the success rate of ERP system implementation in the higher education sector by proposing a synthesised model which can be utilized by the institutions for making successful decisions for the implementation of ERP system. Thus, in the first chapter, the objectives of the study were presented which were o be achieved during the course of the following investigation and were supposed to be concluded at the end. In order to achieve the overall aim and objectives of the study, the theoretical background from the relevant literature was critically reviewed to fully understand the details of the research topic.

The First Objective: To identify problems in the implementation of ERP in HEIs

A broader perspective of the research context was studied so as to understanding the adoption of information technology in the higher education sector. Relevant research was studied which provided an understanding of the functionality, utilization and issues with information technology in the sector. By narrowing down the approach a need for an integrated information system which can provide a solution for the issues was realised. This approach led to a better understanding of ERP systems generally as well as the benefits and challenges of implementing such a system in an educational institution.

The Second Objective: To identify and investigate factors influencing ERP implementation in the context of HEIs.

A critical evaluation of the ERP system implementation, the success factors and lifecycle phases was carried out to understand the in-depth processes and procedures for the adoption of ERP system in an educational setting. In addition to this, a need was identified to deploy a systematic approach for the implementation of ERP system in HEIs. This systematic approach was focused on the identification and prioritization of the key success factors, the ERP lifecycle phases and stages, and the mapping of these key factors across the phases.

A proposed conceptual framework was presented in chapter 3 for the implementation of ERP system in HEIs. This conceptual framework was in alignment with ERP disciplines and the needs of HEIs. The basis of this study was presented in figure 3.10. Key success factors were identified and grouped under four categories which were technical, organisational, project, and system support and the prioritization of these factors was also discussed. Also, the ERP implementation lifecycle phases and stages were presented. It was concluded from the study of the literature that there was a lack of scholarly work which focused on mapping the key success factors across the ERP implementation lifecycle phases and stages in HEIs (Pilat and Devlin, 2004; Léo and Philippe, 2006; Rai and Sambamurthy, 2006; Ahmad et al., 2007; Ozyilmaz and Berg, 2009; Uwizeyemungu and Raymond, 2011). This aspect of the study was considered to be the major contribution towards the existing literature in the field of ERP systems, especially for HEIs.

Objective Three: To develop a framework for evaluating and assessing the success of ERP implementation in HEIs

In Chapter Three a conceptual framework for ERP implementation in higher education institutions was proposed for the identification and prioritization of the influential success factors, the implementation stages, and mapping of these factors across the implementation lifecycle phases and stages.

In chapter 4, the research approach, methodology and design for the conducting of the study together with the justification for decisions taken was presented by the researcher. Three case studies were selected to test the proposed conceptual framework in the context of HEIs in Jordan. The primary research consisted of the collection of qualitative data by semi structured interview. For each case study, representative participants from top management and technical levels in the institution were selected for the interviews and their responses were analysed in the following chapters.

In chapter 5, 6 and 7 the researcher analysed the data collected from the participants of three case studies with participants taken from universities in Jordan. Preliminary research findings were presented with the support of evidence from the feedback of the participants.

In chapter 8 a comparative analysis was performed to generalize the findings and present the evidence from all three case studies. The brief comparative analysis provided the justification for the end of empirical analysis.

Overall, chapter 5, 6, 7 and 8 provided insights and a detailed understanding of the influential factors for the implementation of ERP in HEIs.

Objective Four: To propose an appropriate research plan for the successful implementation of ERP in HEIs by prioritising all the identified factors and mapping them to the ERP implementation lifecycle.

Chapter Nine of the study presents the synthesised model for ERP implementation across lifecycle phases (see Figure 9.2). The model was based on the findings and comparative analysis of three case studies. This chapter provided the proposed model for ERP implementation success in higher education institutions in Figure 9.5, the proposed ERP implementation lifecycle (phases-stages) model in Figure 9.1. Both models are assumed to be helpful for the decision makers in the adoption of an ERP system for higher education institutions. It is also asserted that the knowledge of these revised factors and the prioritization that has been provided can be utilized by the top management and project teams of HEIs for the successful implementation of ERP system.

The researcher emphasizes that although the synthesised model for ERP implementation across lifecycle phases will be helpful it cannot be applied to all decision making scenarios without consideration given to the context. However, the proposed model can be an effective systematic approach to be followed in further research studies for the implementation of ERP systems in HEIs.

10.2 Contributions

The current study has explored multiple dimensions which are important and significant in their own diversified manner. It is expected that the study will contribute through each of its dimension or component for their specific field and sector. The researcher has demonstrated that the research work that has been undertaken will make an original and significant contribution to ERP implementation in HEIs specifically for the Jordan region. Furthermore, the empirical findings from three case studies have been broadened to generalize the

evidence and acquired body of knowledge for all HEIs. This generalization of findings has expanded the scope of the study and provided an in-depth understanding of the needs, reasons for ERP implementation, evaluation of ERP performance, and the challenging factors to be given special attention during the implementation of ERP systems. Emphasis has been placed on the uniqueness and novelty of the contributions without compromising the reliability and validity of the research work. In the view of the researcher the contributions that have been made are detailed in the following section.

10.2.1 Contribution to Theory (Knowledge)

This PhD research contributes to knowledge for successful ERP implementation in HEIs by the following:

The Key Success Factors (KSFs) have been identified. Evaluation measures of ERP performance from different perspectives (organisation, project, system support, and technical) involved in the ERP implementation have been provided. In addition, a synthesised model mapping KSFs on to the phases and stages of the ERP implementation lifecycle has been proposed. Furthermore, the originality of the work has been particularly observed by the identification of the following new key success factors, being: the selection of the right ERP system, the use of qualified IT staff for in-house maintenance and fair and unbiased vendor relations

10.2.2 Contribution to Practice

In addition to the reflected theoretical contribution, this research also contributes to the practices of HEIs, particularly for Jordanian HEIs as, the research findings provide insights of the KSFs for successful ERP implementation, the key success factors which influence successful ERP implementation in HEIs are prioritized according to importance; and also grouped under specific categories, as well as, originality of the research work has claimed by the identification of two new ERP implementation lifecycle stages to be added to the implementation phase which are “testing” and “go live”, and, the influential factors are mapped across the ERP implementation lifecycle phases and this has provided a more detailed and in-depth understanding. By the addressing all the factors and following the recommendations and guidelines HEIs will be able to enhance the success ERP implementation.

All the contributions mentioned above helped the researcher to develop a synthesised model for ERP implementation across the lifecycle phases which was one of the objectives of the study. It is asserted by the researcher that the model presented will provide a guideline for the top management and technical staff of HEIs when dealing with the different issues experienced during the adoption of ERP systems.

10.3 Limitations of the Research

The present study was focused on ERP implementation in HEIs hence the two main components of the study were ERP systems and the implementation in HEIs. ERP itself is an advanced discipline providing varied technological solutions and literature is available for the implementation, benefits, uses, and implications of these systems in different business sectors. This vast treasure of literature made the literature review a complex, critical and analytical process and it was not possible to review all the literature available. Additionally specific literature for ERP implementation in Jordan HEIs was limited. The theoretical concepts consulted and presented in Chapter 3 were based on theories produced by the review of the literature and hence the theoretical propositions were limited to those theories which were the researcher considered to be the most relevant and helpful for the present study context. Therefore the researcher believes that the research work will be a reassessment of existing theories with a revised perspective for the implementation of ERP systems in HEIs.

The ERP system concept and its implications are many and ERP can be used to achieve multiple objectives and purposes. The present research study focused on the positive aspects and impacts of ERP usage in HEIs and the recommendations provided by the study are for the long term future application rather than for short term outcomes. The usefulness and effectiveness of ERP system usage in the higher education sector is being explored to make the recommendations for HEIs for the improvement of business performance and the achievement of goals. Recommendations for further research are provided for further research with the same intention and these recommendations are supposed to be adopted by HEIs. The basic limitation of the study is the limited generalization of the findings and recommendations. In the present case study, only three sample higher education institutions from one country were selected. Also, the number of participants for the case studies was limited due to the time constraints and the needs of the study. Also, finding a larger number

of participants who were not reluctant to give their opinions about decision making or agenda statements proved to be very difficult. The response rate for the semi structured interview protocol was also affected by the lack of relevant knowledge on ERP and personal professional experiences. Therefore, the availability of participants and time constraints restricted the researcher with regard to: the number of interviews, the collection of data from other HEIs or from more than one country. Therefore, the researcher generalized the findings and recommendations based upon only three case studies which has been advocated and supported by researchers in past. Chang and Fang (2017) asserted that if a sample of just two case studies was selected then theoretically findings will be correct and can be generalized in their limited scope.

The present case study has analyzed the ERP implementation concept in more detail and has opened up new horizons for further investigations in the field. The conclusions and findings provided by the present study have created opportunities for researchers and HEIs to investigate the phenomenon further for their ultimate benefit. The advancements from the present study can take two paths: validating the limitations and replicating the project with broader scope, or investigating further the questions raised in the present study. The limitations of the study project can be nullified or limited by adopting a multi-dimensional strategy e.g. increasing the number of respondents, increasing the geographical coverage, or testing other theories.

On the basis of empirical findings and limitations, the researcher recommended the further developing of the present research in the following manner.

More of the higher education institutions should adopt the ERP system to improve their overall performance and achieve their distinctive targets because none of the respondents provided a negative feedback or rejected the importance of ERP installation in their institution. ERP systems can be a very helpful tool in the strategic decision-making process therefore the HEIs should make exceptional efforts and commitments to fully utilize their ERP systems. The selection of an unsuitable ERP system was a disaster for one of the universities studied in case study 1, and in case study 3 compatibility issues of the ERP system were made evident by the feedback. Hence it is suggested that the educational institutions should give the highest importance to the selection of the ERP system which is most appropriate for their

specific academic requirements and organisational targets. The phased implementation of ERP was more successful in case study two than the big bang approach in case study one and case study three. Hence, the phased roll out approach is recommended by the researcher and as it takes longer, time management becomes more critical.

The prioritization and mapping of the key success factors for ERP implementation and new factors and stages have been introduced in the theoretical perspective. It is suggested that any HEI adopting the proposed framework model, prioritization of factors or mapping should conduct both a needs and gap analysis to identify their requirements and finalize their perspectives and then choose the relevant influential factors.

10.4 Future research

It has been mentioned earlier, that the current study is assumed to contribute significantly in the identification and development of the proposed ERP implementation model through the revised implementation stages and prioritization of influential factors. The implications of this study can be considered as relevant for both the higher education sector as well as innovations and explorations for the future research of academics. It is assumed that the practical implementation of the proposed conceptual framework will bring a significant increase in the success of ERP implementations specifically in HEIs and the new approach suggested by the researcher will serve as a guideline for the development of new theories. The theoretical model presented in the study has identified different influential factors under different categories which can be studied from a micro, macro or value creation perspective within the ERP implementation phases and stages. The considerations given to these factors at the time of implementing ERP systems can increase the chances of success and can also provide the strategies to handle the challenges and issues faced by the top management or technical level staff while adopting the ERP systems. The conceptual model has inculcated the unique characteristics of HEIs as the selection of the right ERP systems, organisational culture and the influence of vendors. Furthermore, the study has also identified the new ERP implementation success measurements which are of an individual nature and are needed to be catered for in the context of HEIs. New measurement criteria were based on the analytical and critical opinions by the foremost users and decision makers of the organisation which can impact the overall success of the ERP system. The prioritization of key success factors and

their mapping has provided a clear and distinctive understanding about the challenging factors and their importance at each phase of the ERP implementation lifecycle.

The case studies have provided the knowledge that institutions were facing different issues in their context. Each of the case studies contributed to the existing knowledge and literature regarding the successful implementation of ERP system and helped to devising and develop a model which has suggested a generalized approach and strategy to be adopted by HEIs to make the ERP system successful. The proposed model has also helped in identifying and analysing the key success factors for the implementation of the ERP system by prioritizing their importance in each implementation phase. Therefore, it can be said that more elaborate and validated guidelines than from previous research have been provided by the proposed model to be followed by HEIs to implement the ERP system and reap the maximum benefits out of it.

An important issue related to the contribution of this research is how the results may prove useful in other research contexts. In addition to the significant contributions outlined above, the current research also provides some important directions for future research to continue developing this vital research domain.

It is important for future researchers to be able use the conclusions of this piece of research, but in different contexts, with different samples and methods of data collection and analysis.

It would be useful for similar future research during the shakedown phase to include all stakeholders in the universities.

REFERENCES

Adam, F. and O'Doherty, P., 2000. Lessons from enterprise resource planning implementations in Ireland–towards smaller and shorter ERP projects. *Journal of information technology*, *15*(4), pp.305-316.

Allen, M.J. and Yen, W.M., 2001. *Introduction to measurement theory*. Waveland Press.

Al-Mashari, M. and Al-Mudimigh, A., 2003. ERP implementation: lessons from a case study. *Information Technology & People*, *16*(1), pp.21-33

Al-Mashari, M. and Zairi, M., 2000. Revisiting BPR: a holistic review of practice and development. *Business process management journal*, *6*(1), pp.10-42

Al-Mashari, M., 2002. Enterprise resource planning (ERP) systems: a research agenda. *Industrial Management & Data Systems*, *102*(3), pp.165-170.

Al-Mashari, M., Al-Mudimigh, A. and Zairi, M., 2003. Enterprise resource planning: A taxonomy of critical factors. *European journal of operational research*, *146*(2), pp.352-364.

Al-Mashari, M., Ghani, S.K. and Al-Rashid, W., 2006. A study of the critical success factors of ERP implementation in developing countries. *International Journal of Internet and Enterprise Management*, *4*(1), pp.68-95

Al-Shamlan, H.M. and Al-Mudimigh, A.S., 2011. The Chang management strategies and processes for successful ERP implementation: a case study of MADAR. *International Journal of Computer Science*, *8*(2), pp.399-407

Andersson, T. and von Hellens, L.A., 1997. Information systems work quality. *Information and Software Technology*, *39*(12), pp.837-844

Arif, S., Tree, T.I., Astill, T.P., Tremble, J.M., Bishop, A.J., Dayan, C.M., Roep, B.O. and Peakman, M., 2004. Autoreactive T cell responses show proinflammatory polarization in diabetes but a regulatory phenotype in health.*The Journal of clinical investigation*, *113*(3), pp.451-463.

Ash, C.G. and Burn, J.M., 2003. A strategic framework for the management of ERP enabled e-business change. *European journal of operational research*, *146*(2), pp.374-387

Badewi, A., 2016. The impact of Project Management (PM) and Benefits Management (BM) practices on project success: Towards developing a project benefits governance framework. *International Journal of Project Management*, *34*(4), pp.761-778

Ballantine, J., Bonner, M., Levy, M., Martin, A., Munro, I. and Powell, P.L., 1996. The 3-D model of information systems success: the search for the dependent variable continues. *Information Resources Management Journal (IRMJ)*, *9*(4), pp.5-15

Bansal, P. and K. Corley. "The Coming Of Age For Qualitative Research: Embracing The Diversity Of Qualitative Methods". Academy of Management Journal 54.2 (2011): 233-237. Web.

Bashir, F., Yousaf, F. and Aslam, H., Determinants of Inflation in Pakistan: Demand and Supply Side Analysis.

Basoglu, N., Daim, T. and Kerimoglu, O., 2007. Organizational adoption of enterprise resource planning systems: A conceptual framework. *The Journal of High Technology Management Research*, *18*(1), pp.73-97

Beatty, R.C. and Williams, C.D., 2006. ERP II: best practices for successfully implementing an ERP upgrade. *Communications of the ACM*, *49*(3), pp.105-109.

Beatty, R.C. and Williams, C.D., 2006. ERP II: best practices for successfully implementing an ERP upgrade. *Communications of the ACM*, *49*(3), pp.105-109.

Beheshti, H.M., 2006. What managers should know about ERP/ERP II. *Management Research News*, *29*(4), pp.184-193

Bell, E. and Bryman, A., 2007. The ethics of management research: an exploratory content analysis. *British Journal of Management*, *18*(1), pp.63-77

Benbasat, I., Goldstein, D.K. and Mead, M., 1987. The case research strategy in studies of information systems. *MIS quarterly*, pp.369-386

Bernroider, E.W. and Stix, V., 2003, May. The evaluation of ERP systems using data envelopment analysis. In *Proceedings of IRMA* (Vol. 2003, pp. 283-286)

Bernroider, E.W., 2008. IT governance for enterprise resource planning supported by the DeLone–McLean model of information systems success. *Information & Management*, *45*(5), pp.257-269

Bingi, P., Sharma, M.K. and Godla, J.K., 1999. Critical issues affecting an ERP implementation. *IS Management*, *16*(3), pp.7-14

Boland, R., Norman, A., Ritz, E. and Hasselbach, W., 1985. Presence of a 1, 25-dihydroxy-vitamin D3 receptor in chick skeletal muscle myoblasts. Biochemical and biophysical research communications, 128(1), pp.305-311.

Boland, R.J., 1991. Information system use as a hermeneutic process. *Information systems research: Contemporary approaches and emergent traditions*, pp.439-464

Bryan, V. and Kunzler, A., Bryan, Vincent, Kunzler and Alex, 1999. *Human spinal disc prosthesis*. U.S. Patent 5,865,846.

Bryman, A., 2006. Integrating quantitative and qualitative research: how is it done?. *Qualitative research*, *6*(1), pp.97-113

Chang, C. and Fang, M. (2017). Analyses of the Critical Success Factors on the Implementation of ERP System. DEStech Transactions on Social Science, Education and Human Science, (apme).

Chang, F., Dean, J., Ghemawat, S., Hsieh, W.C., Wallach, D.A., Burrows, M., Chandra, T., Fikes, A. and Gruber, R.E., 2008. Bigtable: A distributed storage system for structured data. *ACM Transactions on Computer Systems (TOCS)*, *26*(2), p.4

Chen, G. and Wang, J., 2010, August. Analysis on performance evaluation system of ERP implementation. In *Information Science and Management Engineering (ISME), 2010 International Conference of* (Vol. 1, pp. 185-188). IEEE.

Chien, S.W. and Tsaur, S.M., 2007. Investigating the success of ERP systems: Case studies in three Taiwanese high-tech industries. *Computers in Industry*, *58*(8), pp.783-793

Coaldrake, P., 1995. Implications for higher education of the public sector reform agenda. *Australian Universities' Review, The*, *38*(1), p.38.

Conrath, D.W. and Mignen, O.P., 1990. What is being done to measure user satisfaction with EDP/MIS. *Information & Management*, *19*(1), pp.7-19

Cooper, D.R. and Schindler, P.S., 2006. Business research methods: Empirical investigation. *Journal of service research*, *1*(2), pp.108-28

Cooper, D.R., Schindler, P.S. and Sun, J., 2003. Business research methods

Cox, J.F. and Clark, S.J., 1984. Problems in implementing and operating a manufacturing resource planning information system. *Journal of Management Information Systems*, *1*(1), pp.81-101

Crocker, L. and Algina, J., 1986. *Introduction to classical and modern test theory*. Holt, Rinehart and Winston, 6277 Sea Harbor Drive, Orlando, FL 32887

Darmawan, I.G.N., 2001. Adoption and implementation of information technology in Bali's local government: A comparison between single level path analyses using PLSPATH 3.01 and

AMOS 4 and Multilevel Path Analyses using MPLUS 2.01. *International Education Journal*, *2*(4), pp.100-125

Davenport, T.H. and Prusak, L., 1998. *Working knowledge: How organizations manage what they know*. Harvard Business Press

Davison, R., 2002. Cultural complications of ERP. *Communications of the ACM*, *45*(7), pp.109-111

Dawis, R.V. and Lofquist, L.H., 1984. *A psychological theory of work adjustment: An individual-differences model and its applications*. University of Minnesota Press

DeLone, W.H. and McLean, E.R., 1992. Information systems success: The quest for the dependent variable. *Information systems research*, *3*(1), pp.60-95.

Delone, W.H. and McLean, E.R., 2003. The DeLone and McLean model of information systems success: a ten-year update. *Journal of management information systems*, *19*(4), pp.9-30

Denzin, N.K. and Lincoln, Y.S., 1998. The Landscape of Qualitative Research: Theories and Issues

Denzin, N.K., 1978. *Sociological methods: A sourcebook*. McGraw-Hill Companies

Despont-Gros, C., Mueller, H. and Lovis, C., 2005. Evaluating user interactions with clinical information systems: a model based on human–computer interaction models. *Journal of biomedical informatics*, *38*(3), pp.244-255

Dishaw, M., Strong, D. and Bandy, D.B., 2002. Extending the task-technology fit model with self-efficacy constructs. *AMCIS 2002 Proceedings*, p.143

Dishaw, M.T. and Strong, D.M., 1999. Extending the technology acceptance model with task–technology fit constructs. *Information & management*, *36*(1), pp.9-21

Donovan, P.J. and Gearhart, J., 2001. The end of the beginning for pluripotent stem cells. *Nature*, *414*(6859), pp.92-97.

Donovan, P.J. and Gearhart, J., 2001. The end of the beginning for pluripotent stem cells. *Nature*, *414*(6859), pp.92-97.

Ehie, I.C. and Madsen, M., 2005. Identifying critical issues in enterprise resource planning (ERP) implementation. *Computers in industry*, *56*(6), pp.545-557

Ehie, I.C. and Madsen, M., 2005. Identifying critical issues in enterprise resource planning (ERP) implementation. *Computers in industry*, *56*(6), pp.545-557

Esteves, J. and Pastor, J., 1999. An ERP lifecycle-based research agenda. In *1st International Workshop in Enterprise Management & Resource Planning*

Esteves, J. and Pastor, J., 2004. Using a multimethod approach to research enterprise systems implementations. *Electronic Journal of Business Research Methods*, *2*(2), pp.69-82.

Esteves, J. and Pastor, J., 2004. Using a multimethod approach to research enterprise systems implementations. *Electronic Journal of Business Research Methods*, *2*(2), pp.69-82.

Fahy, P.J., Crawford, G. and Ally, M., 2001. Patterns of interaction in a computer conference transcript. *The International Review of Research in Open and Distributed Learning*, *2*(1).

Feeny, D.F. and Ives, B., 1990. In search of sustainability: Reaping long-term advantage from investments in information technology. *Journal of Management Information Systems*, *7*(1), pp.27-46

Finney, S. and Corbett, M., 2007. ERP implementation: a compilation and analysis of critical success factors. *Business Process Management Journal*, *13*(3), pp.329-347

Flick, K.E., Flick and Kenneth E., 1998. *Vehicle security system for a vehicle having a data communications bus and related methods*. U.S. Patent 5,719,551

Fowler, A. and Gilfillan, M., 2003. A framework for stakeholder integration in higher education information systems projects. *Technology Analysis & Strategic Management*, *15*(4), pp.468-489.

Fui-Hoon Nah, F., Lee-Shang Lau, J. and Kuang, J., 2001. Critical factors for successful implementation of enterprise systems. *Business process management journal*, *7*(3), pp.285-296.

Gable, G.G., Sedera, D. and Chan, T., 2008. Re-conceptualizing information system success: The IS-impact measurement model. *Journal of the association for information systems*, *9*(7), p.377

Galliers, R., 1992. *Information systems research: Issues, methods and practical guidelines*. Blackwell Scientific

Ganesh, L. and Mehta, A. (2016). Understanding Cloud Based ERP Implementation in Light of Conventional ERP Implementation at Indian SMEs: A Case Study. SSRN Electronic Journal.

Gargeya, V.B. and Brady, C., 2005. Success and failure factors of adopting SAP in ERP system implementation. *Business Process Management Journal*, *11*(5), pp.501-516

Gattiker, T.F. and Goodhue, D.L., 2005. What happens after ERP implementation: understanding the impact of interdependence and differentiation on plant-level outcomes. *MIS quarterly*, pp.559-585.

Gattiker, T.F. and Goodhue, D.L., 2005. What happens after ERP implementation: understanding the impact of interdependence and differentiation on plant-level outcomes. *MIS quarterly*, pp.559-585.

Goel, S., Duda, D.G., Xu, L., Munn, L.L., Boucher, Y., Fukumura, D. and Jain, R.K., 2011. Normalization of the vasculature for treatment of cancer and other diseases. *Physiological reviews*, *91*(3), pp.1071-1121.

Goodhue, D.L. and Thompson, R.L., 1995. Task-technology fit and individual performance. *MIS quarterly*, pp.213-236

Goodhue, D.L., 1995. Understanding user evaluations of information systems. *Management science*, *41*(12), pp.1827-1844

Goodhue, D.L., 1998. Development and measurement validity of a task-technology fit instrument for user evaluations of information system. *Decision sciences*, *29*(1), pp.105-138

Goodhue, D.L., Klein, B.D. and March, S.T., 2000. User evaluations of IS as surrogates for objective performance. *Information & Management*, *38*(2), pp.87-101

Grabski, S.V. and Leech, S.A., 2007. Complementary controls and ERP implementation success. *International Journal of Accounting Information Systems*, *8*(1), pp.17-39

Gratton, C. and Jones, I., 2010. *Research methods for sports studies*. Taylor & Francis

Gray, D.E., 2009. *Doing research in the real world*. Sage.

Gray, D.F., 2005. *The observation and analysis of stellar photospheres*. Cambridge University Press

Guha, S., Mishra, N., Motwani, R. and O'Callaghan, L., 2000. Clustering data streams. In *Foundations of computer science, 2000. proceedings. 41st annual symposium on* (pp. 359-366). IEEE

Hakim, C., 2000. *Research design: Successful designs for social and economic research*. Psychology Press

Hammer, M. and Champy, J., 1993. Reengineering the Corporations

Han, J., Pei, J., Yin, Y. and Mao, R., 2004. Mining frequent patterns without candidate generation: A frequent-pattern tree approach. *Data mining and knowledge discovery*, *8*(1), pp.53-87

Hannah-Moffat, K. and Shaw, M., 2000. Thinking about cognitive skills? Think again!

Hawking, D., 2004, January. Challenges in enterprise search. In *Proceedings of the 15th Australasian database conference-Volume 27* (pp. 15-24). Australian Computer Society, Inc.

Hawkins, B.L. and Rudy, J.A., 2007. EDUCAUSE Core Data Service: Fiscal Year 2006 Summary Report. *EDUCAUSE*.

Helo, P., Anussornnitisarn, P. and Phusavat, K., 2008. Expectation and reality in ERP implementation: consultant and solution provider perspective.*Industrial Management & Data Systems*, *108*(8), pp.1045-1059.

Hillman Willis, T. and Hillary Willis-Brown, A., 2002. Extending the value of ERP. *Industrial Management & Data Systems*, *102*(1), pp.35-38.

Holland, C.P. and Light, B., 1999. A critical success factors model for ERP implementation. *IEEE software*, *16*(3), p.30

Holland, C.P., Light, B. and Gibson, N., 1999. A critical success factors model for enterprise resource planning implementation. In *Proceedings of the 7th European Conference on Information Systems* (Vol. 1, pp. 273-287).

Holsapple, C.W. and Sena, M.P., 2003. The decision-support characteristics of ERP systems. *International Journal of Human-Computer Interaction*,*16*(1), pp.101-123.

Hong, K.K. and Kim, Y.G., 2002. The critical success factors for ERP implementation: an organizational fit perspective. *Information & Management*, *40*(1), pp.25-40.

Huberman, M. and Miles, M.B., 2002. *The qualitative researcher's companion*. Sage

Ifinedo, P. and Nahar, N., 2006. Quality, impact and success of ERP systems: a study involving some firms in the Nordic-Baltic region. *Journal of Information Technology Impact*, *6*(1), pp.19-46.

Ifinedo, P. and Nahar, N., 2007. ERP systems success: an empirical analysis of how two organizational stakeholder groups prioritize and evaluate relevant measures. *Enterprise Information Systems*, *1*(1), pp.25-48

Ives, B., Hamilton, S. and Davis, G.B., 1980. A framework for research in computer-based management information systems. *Management science*, *26*(9), pp.910-934

Janesick, V.J., 2000. The choreography of qualitative research design. *Handbook of Qualitative Research.*, pp.379-399

Jankowicz, D., 2000. FromLearning Organization'toAdaptive Organization'. *Management Learning*, *31*(4), pp.471-490

Jarrar, Y.F., Al-Mudimigh, A. and Zairi, M., 2000. ERP implementation critical success factors-the role and impact of business process management. In *Management of Innovation and Technology, 2000. ICMIT 2000. Proceedings of the 2000 IEEE International Conference on* (Vol. 1, pp. 122-127). IEEE

Jesitus, J., 1997. Change management: energy to the people. *Industry Week*,*246*(16), pp.37-41.

Joachims, T., Granka, L., Pan, B., Hembrooke, H. and Gay, G., 2005, August. Accurately interpreting clickthrough data as implicit feedback. In *Proceedings of the 28th annual international ACM SIGIR conference on Research and development in information retrieval* (pp. 154-161). Acm

Kaplan, R.M. and Maxwell III, J.T., Xerox Corporation, 1994. *Text-compression technique using frequency-ordered array of word-number mappers*. U.S. Patent 5,325,091

Katerattanakul, P., Hong, S. and Lee, J., 2006. Enterprise resource planning survey of Korean manufacturing firms. *Management Research News*, *29*(12), pp.820-837.

Kaul, S., Koo, H.L., Jenkins, J., Rizzo, M., Rooney, T., Tallon, L.J., Feldblyum, T., Nierman, W., Benito, M.I., Lin, X. and Town, C.D., 2000. Analysis of the genome sequence of the flowering plant Arabidopsis thaliana. *nature*,*408*(6814), pp.796-815.and resistance. In *Realigning Research and Practice in Information Systems Development* (pp. 149-162). Springer US.

Ketokivi, M. and Mantere, S., 2010. Two strategies for inductive reasoning in organizational research. *Academy of Management Review*, *35*(2), pp.315-333

Kimberlin, C.L. and Winterstein, A.G., 2008. Validity and reliability of measurement instruments used in research. *Am J Health Syst Pharm*, *65*(23), pp.2276-84

Klaus, H., Rosemann, M. and Gable, G.G., 2000. What is ERP? *Information systems frontiers*, *2*(2), pp.141-162.

Koch, P., 2001. Lexical typology. *Language typology and language universals. An international handbook. Berlin/New York*.

Koch, P.L. and Phillips, D.L., 2002. Incorporating concentration dependence in stable isotope mixing models: a reply to Robbins, Hilderbrand and Farley (2002). *Oecologia*, *133*(1), pp.14-18.

Kositanurit, B., Ngwenyama, O. and Osei-Bryson, K.M., 2006. An exploration of factors that impact individual performance in an ERP environment: an analysis using multiple analytical techniques. *European Journal of Information Systems*, *15*(6), pp.556-568

Kumar, D. and Shivashankar, G. (2017). Synchronization of Enterprise Resource Planning (ERP) Modules in Product Lifecycle Management (PLM). International Journal of Engineering Research and, V6(04).

Kvavik, R.B. and Katz, R.N., 2002. E-business in higher education.

Kvavik, R.B., Katz, R.N., Beecher, K., Caruso, J., King, P., Voloudakis, J. and Williams, L.A., 2002. The promise and performance of enterprise systems for higher education. *EDUCAUSE Center for Applied Research*, *4*, pp.1-123.

Lado, A.A. and Wilson, M.C., 1994. Human resource systems and sustained competitive advantage: A competency-based perspective. *Academy of management review*, *19*(4), pp.699-727

Law, C.C. and Ngai, E.W., 2007. ERP systems adoption: An exploratory study of the organizational factors and impacts of ERP success. *Information & Management*, *44*(4), pp.418-432

Law, C.C., Chen, C.C. and Wu, B.J., 2010. Managing the full ERP life-cycle: Considerations of maintenance and support requirements and IT governance practice as integral elements of the formula for successful ERP adoption. *Computers in Industry*, *61*(3), pp.297-308.

Lawnham, P., 2001. Soft dollar fills UNSW coffers. *Higher Education Supplement, The Australian*, p.29.

Lechtchinskaia, L., Uffen, J. and Breitner, M.H., 2011, August. Critical Success Factors for Adoption of Integrated Information Systems in Higher Education Institutions-a Meta-Analysis. In *AMCIS*.

Lee, A.S. and Hubona, G.S., 2009. A scientific basis for rigor in information systems research. *MIS Quarterly*, pp.237-262

Lee, D.D. and Seung, H.S., 1999. Learning the parts of objects by non-negative matrix factorization. *Nature*, *401*(6755), pp.788-791

Levinson, M.E. and Golik, G.I., Scion Cardio-Vascular, Inc., 2001. *Vascular protection and embolic material retriever*. U.S. Patent 6,277,139.

Levinson, M.E. and Golik, G.I., Scion Cardio-Vascular, Inc., 2001. *Vascular protection and embolic material retriever*. U.S. Patent 6,277,139.

Levis, P. and Gay, D., 2009. *TinyOS programming*. Cambridge University Press

Levy, S. and Beaulieu, R., 2003. Online distance learning among the California community colleges: Looking at the planning and implementation.*The American Journal of Distance Education*, *17*(4), pp.207-220.

Lozinsky, S., 1998. *Enterprise-wide software solutions: integration strategies and practices*. Reading, MA: Addison-Wesley.

Madden, S., Franklin, M.J., Hellerstein, J.M. and Hong, W., 2002. TAG: A tiny aggregation service for ad-hoc sensor networks. *ACM SIGOPS Operating Systems Review*, *36*(SI), pp.131-146.

Mandal, P. and Gunasekaran, A., 2002. An analysis of quality initiatives in the Australian and Indian manufacturing industries. *International journal of manufacturing technology and management*, *4*(3-4), pp.210-220

Mandal, P. and Gunasekaran, A., 2003. Issues in implementing ERP: A case study. *European Journal of Operational Research*, *146*(2), pp.274-283

Marakas, G.M., Johnson, R.D. and Clay, P.F., 2007. The evolving nature of the computer self-efficacy construct: An empirical investigation of measurement construction, validity, reliability and stability over time. *Journal of the Association for Information Systems*, *8*(1), p.15

Marginson, P. and Sisson, K., 1996. Multinational companies and the future of collective bargaining: a review of the research issues. *European Journal of Industrial Relations*, *2*(2), pp.173-197.

Markus, M.L. and Tanis, C., 2000. The enterprise systems experience-from adoption to success. *Framing the domains of IT research: Glimpsing the future through the past*, *173*, pp.207-173.

Markus, M.L., Axline, S., Petrie, D. and Tanis, S.C., 2000. Learning from adopters' experiences with ERP: problems encountered and success achieved. *Journal of information technology*, *15*(4), pp.245-265

Markus, M.L., Tanis, C. and Van Fenema, P.C., 2000. Enterprise resource planning: multisite ERP implementations. *Communications of the ACM*, *43*(4), pp.42-46

Marshall, C. and Rossman, G.B., 1999. The "what" of the study: Building the conceptual framework. *Designing qualitative research*, *3*, pp.21-54

Marshall, B., Cardon, P., Poddar, A. and Fontenot, R., 2013. Does sample size matter in qualitative research?: A review of qualitative interviews in IS research. Journal of Computer Information Systems, 54(1), pp.11-22.

Mason, R.O., 1978. Measuring information output: A communication systems approach. *Information & management*, *1*(4), pp.219-234

Mathiassen, L., 2002. Collaborative practice research. *Information Technology & People*, *15*(4), pp.321-345

Maxie Burns, O., Turnipseed, D. and Riggs, W.E., 1991. Critical success factors in manufacturing resource planning implementation. *International Journal of Operations & Production Management*, *11*(4), pp.5-19

McConachie, H., Huq, S., Munir, S., Akhter, N., Ferdous, S. and Khan, N.Z., 2001. Difficulties for mothers in using an early intervention service for children with cerebral palsy in Bangladesh. *Child: care, health and development*,*27*(1), pp.1-12.

McConachie, H., Huq, S., Munir, S., Akhter, N., Ferdous, S. and Khan, N.Z., 2001. Difficulties for mothers in using an early intervention service for children with cerebral palsy in Bangladesh. *Child: care, health and development*,*27*(1), pp.1-12.

Mehlinger, L., 2006. *indicators of Successful enterprise technology implementations in higher education Business Morgan state Morgan state university* (Doctoral dissertation, Ph. D).

Millman, G.J., 2004. What did you get from ERP and what can you get? Many corporations are still looking for a meaningful return on all their investments in enterprise resource planning systems. While it's easy to blame the vendors, a company's approach to

implementing the technology appears to be a common problem. *Financial Executive*, *20*(3), pp.38-43

Mingers, J., 2003. The paucity of multimethod research: a review of the information systems literature. *Information Systems Journal*, *13*(3), pp.233-249

Motwani, J., Mirchandani, D., Madan, M. and Gunasekaran, A., 2002. Successful implementation of ERP projects: evidence from two case studies. *International Journal of Production Economics*, *75*(1), pp.83-96

Motwani, J., Subramanian, R. and Gopalakrishna, P., 2005. Critical factors for successful ERP implementation: Exploratory findings from four case studies. *Computers in Industry*, *56*(6), pp.529-544

Murphy, G., 2004. *The big book of concepts*. MIT press.

Murphy, G., Chang, A. and Unsworth, K. (2012). Differential effects of ERP systems on user outcomes-a longitudinal investigation. New Technology, Work and Employment, 27(2), pp.147-162.

Murray, M. and Coffin, G., 2001. A case study analysis of factors for success in ERP system implementations. *AMCIS 2001 Proceedings*, p.196

Muscatello, J.R., Small, M.H. and Chen, I.J., 2003. Implementing enterprise resource planning (ERP) systems in small and midsize manufacturing firms.*International Journal of Operations & Production Management*, *23*(8), pp.850-871.

Myers, M.D. and Avison, D. eds., 2002. *Qualitative research in information systems: a reader*. Sage

Nah, F.F.H. and Delgado, S., 2006. Critical success factors for enterprise resource planning implementation and upgrade. *Journal of Computer Information Systems*, *46*(5), pp.99-113

Nah, F.F.H., Zuckweiler, K.M. and Lee-Shang Lau, J., 2003. ERP implementation: chief information officers' perceptions of critical success factors. *International Journal of Human-Computer Interaction*, *16*(1), pp.5-22

Newman, M. and Westrup, C., 2005. Making ERPs work: accountants and the introduction of ERP systems. *European Journal of Information Systems*,*14*(3), pp.258-272.

Ng, C., Losso, J.N., Marshall, W.E. and Rao, R.M., 2002. Freundlich adsorption isotherms of agricultural by-product-based powdered activated carbons in a geosmin–water system. *Bioresource technology*, *85*(2), pp.131-135.

Ngai, E.W.T., Moon, K.K., Riggins, F.J. and Candace, Y.Y., 2008. RFID research: An academic literature review (1995–2005) and future research directions. *International Journal of Production Economics*, *112*(2), pp.510-520.

Nicolaou, A. and Bhattacharya, S. (2006). Organizational performance effects of ERP systems usage: The impact of post-implementation changes. *International Journal of Accounting Information Systems*, 7(1), pp.18-35.

Noaman, A.Y. and Ahmed, F.F., 2015. ERP Systems Functionalities in Higher Education. *Procedia Computer Science*, *65*, pp.385-395.

O'Leary, D.E., 2000. *Enterprise resource planning systems: systems, life cycle, electronic commerce, and risk*. Cambridge university press.

Oliver, N.M., Rosario, B. and Pentland, A.P., 2000. A bayesian computer vision system for modeling human interactions. *IEEE transactions on pattern analysis and machine intelligence*, *22*(8), pp.831-843

Olson, E.M., Slater, S.F. and Hult, G.T.M., 2005. The performance implications of fit among business strategy, marketing organization structure, and strategic behavior. *Journal of marketing*, *69*(3), pp.49-65

Ozyilmaz, A. and Berg, D., 2009. The role of Information Technology in service innovation in the two different quadrants of the service-process matrix. *International Journal of Services Technology and Management*, *11*(3), pp.247-271

Parr, A. and Shanks, G., 2000. A model of ERP project implementation. *Journal of information Technology*, *15*(4), pp.289-303

Pearlson, K.E., Saunders, C.S. and Galletta, D.F., 2016. *Managing and Using Information Systems, Binder Ready Version: A Strategic Approach*. John Wiley & Sons

Petter, S., DeLone, W. and McLean, E., 2008. Measuring information systems success: models, dimensions, measures, and interrelationships. *European journal of information systems*, *17*(3), pp.236-263

Pilat, D. and Devlin, A., 2004. The diffusion of ICT in OECD economies. *The economic impact of ICT*, p.19

Pitt, L.F., Watson, R.T. and Kavan, C.B., 1995. Service quality: a measure of information systems effectiveness. *MIS quarterly*, pp.173-187

Plant, R. and Willcocks, L., 2007. Critical success factors in international ERP implementations: a case research approach. *Journal of Computer Information Systems*, *47*(3), pp.60-70

Porter, M.E., 1996. What is strategy?. *Published November*.

Prybutok, V.R., Kappelman, L.A. and Myers, B.L., 1997. A comprehensive model for assessing the quality and productivity of the information systems function: toward a theory for information systems assessment. *Information Resources Management Journal*, *10*(1), pp.6

Rabaa'i, A.A., 2009, July. The impact of organisational culture on ERP systems implementation: Lessons from jordan. In *Proceedings of the Pacific Asia Conference on Information Systems 2009*.

Rai, A. and Sambamurthy, V., 2006. Editorial notes-the growth of interest in services management: Opportunities for information systems scholars. *Information Systems Research*, *17*(4), pp.327-331

Rai, A., Lang, S.S. and Welker, R.B., 2002. Assessing the validity of IS success models: An empirical test and theoretical analysis. *Information systems research*, *13*(1), pp.50-69

Rajagopal, P., 2002. An innovation—diffusion view of implementation of enterprise resource planning (ERP) systems and development of a research model. *Information & Management*, *40*(2), pp.87-114

Ramayah, T., Roy, M.H., Arokiasamy, S., Zbib, I. and Ahmed, Z.U., 2007. Critical success factors for successful implementation of enterprise resource planning systems in manufacturing organisations. *International Journal of Business Information Systems*, *2*(3), pp.276-297

Rao Siriginidi, S., 2000. Enterprise resource planning in reengineering business. *Business Process Management Journal*, *6*(5), pp.376-391.

Ravindrakumar Rajput, Jitesh Gupta, Sonali Gulve and Sujit Ahirrao (2015). Mobile Based College ERP System (M–ERP). International Journal of Engineering Research and, V4(03).

Remenyi, D. and Williams, B., 1996. The nature of research: qualitative or quantitative, narrative or paradigmatic?. *Information Systems Journal*, *6*(2), pp.131-146

Ribbers, P.M. and Schoo, K.C., 2002. Program management and complexity of ERP implementations. *Engineering Management Journal*, *14*(2), pp.45-52.

Robey, D., 1996. Research commentary: diversity in information systems research: threat, promise, and responsibility. *Information systems research*, *7*(4), pp.400-408

Robey, D., Ross, J.W. and Boudreau, M.C., 2002. Learning to implement enterprise systems: An exploratory study of the dialectics of change. *Journal of Management Information Systems*, *19*(1), pp.17-46

Ross, J.W. and Vitale, M.R., 2000. The ERP revolution: surviving vs. thriving. *Information systems frontiers*, *2*(2), pp.233-241

Rushinek, A. and Rushinek, S.F., 1986. What makes users happy?. *Communications of the ACM*, *29*(7), pp.594-598

Sabherwal, R., Jeyaraj, A. and Chowa, C., 2006. Information system success: individual and organizational determinants. *Management science*, *52*(12), pp.1849-1864.

Salmeron, J.L. and Lopez, C., 2010. A multicriteria approach for risks assessment in ERP maintenance. *Journal of Systems and Software*, *83*(10), pp.1941-1953.

Salmeron, J.L. and Lopez, C., 2010. A multicriteria approach for risks assessment in ERP maintenance. *Journal of Systems and Software*, *83*(10), pp.1941-1953.

Sanders, D.B., Salvato, M., Aussel, H., Ilbert, O., Scoville, N., Surace, J.A., Frayer, D.T., Sheth, K., Helou, G., Brooke, T. and Bhattacharya, B., 2007. S-COSMOS: The Spitzer Legacy Survey of the Hubble Space Telescope ACS 2 deg2 COSMOS Field I: Survey Strategy and First AnalysisBased on observations with the NASA/ESA Hubble Space Telescope obtained at the Space Telescope Science Institute, which is operated by the Association of Universities for Research in Astronomy (AURA), Inc., under NASA contract NAS 5-26555; also based on data collected at the Subaru Telescope, which is operated by the National Astronomical Observatory of Japan; the XMM-Newton, an .... *The Astrophysical Journal Supplement Series*, *172*(1), p.86

Sanders, J.A., Verhulst, F. and Murdock, J., 2007. Basic Material and Asymptotics. In *Averaging Methods in Nonlinear Dynamical Systems* (pp. 1-19). Springer New York

Sarker, S. and Lee, A.S., 2003. Using a case study to test the role of three key social enablers in ERP implementation. *Information & Management*, *40*(8), pp.813-829

Saunders, M., Lewis, P. and Thornhill, A (2016) *Research methods for business students*, Financial Times/Prentice Hall.

Saunders, M.N. and Rojon, C., 2011. On the attributes of a critical literature review. *Coaching: An International Journal of Theory, Research and Practice*, *4*(2), pp.156-162

Sawyer, S. and Southwick, R., 2002. Temporal issues in information and communication technology-enabled organizational change: Evidence from an enterprise systems implementation. *The Information Society*, *18*(4), pp.263-280.

Scheer, A.W. and Habermann, F., 2000. Enterprise resource planning: making ERP a success. *Communications of the ACM*, *43*(4), pp.57-61.

Schutz, A., 1967. *The phenomenology of the social world*. Northwestern University Press

Seddon, P.B., 1997. A respecification and extension of the DeLone and McLean model of IS success. *Information systems research*, *8*(3), pp.240-253

Sedera, D. and Gable, G., 2004. A factor and structural equation analysis of the enterprise systems success measurement model. *ICIS 2004 Proceedings*, p.36

Sekaran, U. and Bougie, R., 2003. Research methodology for business

Sendall, P., Ceccucci, W. and Peslak, A., 2008. Web 2.0 matters: An analysis of implementing Web 2.0 in the classroom. *Information Systems Education Journal*, *6*(64), pp.1-17

Shanks, G., Parr, A., Hu, B., Corbitt, B., Thanasankit, T. and Seddon, P., 2000. Differences in critical success factors in ERP systems implementation in Australia and China: a cultural analysis. *ECIS 2000 Proceedings*, p.53.

Shannon, C.E. and Weaver, W., 1949. The mathematical theory of information.

Shaw, E., 1999. A guide to the qualitative research process: evidence from a small firm study. *Qualitative Market Research: An International Journal*, *2*(2), pp.59-70

Shehab, E.M., Sharp, M.W., Supramaniam, L. and Spedding, T.A., 2004. Enterprise resource planning: An integrative review. *Business Process Management Journal*, *10*(4), pp.359-386.

Siau, K. and Messersmith, J., 2003. Analyzing ERP implementation at a public university using the innovation strategy model. *International Journal of Human-Computer Interaction*, *16*(1), pp.57-80

Siau, K., 2004. Informational and computational equivalence in comparing information modeling methods. *Journal of Database Management*, *15*(1), p.73.

Sidorova, A., Evangelopoulos, N., Valacich, J.S. and Ramakrishnan, T., 2008. Uncovering the intellectual core of the information systems discipline. *Mis Quarterly*, pp.467-482

Soh, C., Kien, S.S. and Tay-Yap, J., 2000. Enterprise resource planning: cultural fits and misfits: is ERP a universal solution?. *Communications of the ACM*, *43*(4), pp.47-51.

Soja, P., 2006. Success factors in ERP systems implementations: lessons from practice. *Journal of enterprise information management*, *19*(4), pp.418-433.

Somers, T.M. and Nelson, K., 2001, January. The impact of critical success factors across the stages of enterprise resource planning implementations. In *System Sciences, 2001. Proceedings of the 34th Annual Hawaii International Conference on* (pp. 10-pp). IEEE

Somers, T.M. and Nelson, K.G., 2004. A taxonomy of players and activities across the ERP project life cycle. *Information & Management*, *41*(3), pp.257-278

Stilwell, B., Diallo, K., Zurn, P., Dal Poz, M.R., Adams, O. and Buchan, J., 2003. Developing evidence-based ethical policies on the migration of health workers: conceptual and practical c .

Stilwell, B., Diallo, K., Zurn, P., Dal Poz, M.R., Adams, O. and Buchan, J., 2003. Developing evidence-based ethical policies on the migration of health workers: conceptual and practical challenges. *Human Resources for health*,*1*(1), p.1.

Stilwell, B., Diallo, K., Zurn, P., Dal Poz, M.R., Adams, O. and Buchan, J., 2003. Developing evidence-based ethical policies on the migration of health workers: conceptual and practical.

Stilwell, B., Diallo, K., Zurn, P., Dal Poz, M.R., Adams, O. and Buchan, J., 2003. Developing evidence-based ethical policies on the migration of health workers: conceptual and practical challenges. *Human Resources for health*,*1*(1), p.1.

Sudevan, S., Bhasi, M. and Pramod, K. (2014). Distinct Stakeholder Roles Across the ERP Implementation Lifecycle. International Journal of Enterprise Information Systems, 10(4), pp.59-72.

Supramaniam, M., Abdullah, A. and Ponnan, R. (2014). Cost Analysis on ERP System Implementation amongst Malaysian SMEs. International Journal of Trade, Economics and Finance, pp.72-76

Tarafdar, M. and Roy, R.K., 2003. Analyzing the adoption of enterprise resource planning systems in Indian organizations: a process framework. *Journal of Global Information Technology Management*, *6*(1), pp.21-51

Tashakkori, A. and Teddlie, C. eds., 2010. *Sage handbook of mixed methods in social & behavioral research*. Sage

Teddlie, C. and Yu, F., 2007. Mixed methods sampling a typology with examples. *Journal of mixed methods research*, *1*(1), pp.77-100

Udo, G.J. and Guimaraes, T., 1994. Empirically assessing factors related to DSS benefits. *European Journal of Information Systems*, *3*(3), pp.218-227.

Umble, E.J. and Umble, M.M., 2002. Avoiding ERP implementation failure. *INDUSTRIAL MANAGEMENT-CHICAGO THEN ATLANTA-*, pp.25-33

Umble, E.J., Haft, R.R. and Umble, M.M., 2003. Enterprise resource planning: Implementation procedures and critical success factors. *European journal of operational research*, *146*(2), pp.241-257

Uwizeyemungu, S. and Raymond, L., 2011. Information technology adoption and assimilation: Towards a research framework for service sector SMEs. *Journal of Service Science and Management*, *4*(02), p.141

Van Nieuwenhuyse, I., De Boeck, L., Lambrecht, M. and Vandaele, N.J., 2011. Advanced resource planning as a decision support module for ERP.*Computers in Industry*, *62*(1), pp.1-8.

Volkoff, H., Bjorklund, J.M. and Peter, R.E., 1999. Stimulation of feeding behavior and food consumption in the goldfish, Carassius auratus, by orexin-A and orexin-B. *Brain research*, *846*(2), pp.204-209.

Wainer, H. and Braun, H.I., 2013. Test validity. Routledge.

Wallace, M. and Wray, A., 2006. Criticalreadingandwritingforpostgraduates

Walsham, G., 1993. *Interpreting information systems in organizations*. John Wiley & Sons, Inc.

Watson, J., 1999. *Nursing: Human science and human care: A theory of nursing* (Vol. 15, No. 2236). ones & Bartlett Learning.

Weber, S., 2004. *The success of open source* (Vol. 368). Cambridge, MA: Harvard University Press

Wu, J. and Wang, Y. (2007). Measuring ERP success: The key-users' viewpoint of the ERP to produce a viable IS in the organization. *Computers in Human Behavior*, 23(3), pp.1582-1596.

Yin, Robert K. Case Study Research. 1st ed. Los Angeles, Calif.: Sage Publications, 2009. Print.

Yin, S., Luo, H. and Ding, S.X., 2014. Real-time implementation of fault-tolerant control systems with performance optimization. *IEEE Transactions on Industrial Electronics*, *61*(5), pp.2402-2411

Yusuf, S., Hawken, S., Ôunpuu, S., Dans, T., Avezum, A., Lanas, F., McQueen, M., Budaj, A., Pais, P., Varigos, J. and Lisheng, L., 2004. Effect of potentially modifiable risk factors associated

with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *The Lancet*,*364*(9438), pp.937-952.

Yusuf, Y., Gunasekaran, A. and Abthorpe, M.S., 2004. Enterprise information systems project implementation:: A case study of ERP in Rolls-Royce. *International Journal of Production Economics*, *87*(3), pp.251-266

APPENDIX A:

Interview Protocol (Technical Level)

Targeted Participants	Stages	Questions	Rational
Technical Level (Project Managers/ Directors)	Introduction (2 min)	Nature of research and how will be used Research study aims to investigate successful ERP implementation for higher educational institutions. Will be used in PhD thesis and also for academic publications and conference papers. Recording for recollection purposes / quotes. Anything said will be treated as confidential and anonymous/ your personal data will not be passed on to anyone else. I'll nod a lot because I want to hear you, not me… Think of this as an informal chat. There are no right or wrong answers and I'm interested in your honest views and opinions about the topic. So, before we start, please fill in the consent form.	To provide a clear set of instructions for interviewers and interviewees. To get consent from interviewees.
	Warming up (3 min)	Now tell me a little bit about yourself, • Your current positon at this university? How long? • What do you do for your current role?	To help the participant feel comfortable
	General information about ERP system at your organisation (10 mins)	• What is the name of the ERP system used? And when did it start? • What is ERP implementation stage of the organisation? • What were the reasons for implementing the ERP? • Who are the main users of the ERP?	To collect basic and contextual information about the ERP system
	Issues/challenges across ERP implementation stages	• What are the key challenges and issues facing your organisation across the ERP	The purpose of this step is not to generate logic model components but rather to gather

	(15 mins – or more if they are willing to talk!!)	implementation stages, stage by stage on ERP Lifecycle? • What are the problems in using ERP systems? • What are the challenges in maintaining the ERP systems? (internal/external) • How do you think the ERP perform? Is it running smoothly or with some challenges/ difficulties? • What do you think about the quality of the system?	information that can provide evaluators with greater understanding of the general purpose of the ERP and the potential obstacles that it faces.
	Key factors influencing successful implementation of ERP system (15 mins)	Let's move on to KSFs for ERP implementation. My research is particularly interested in investigating this from both technical and organisational aspects. • Please identify any factors that may affect the ERP implementation? • How did your university process and transform from the old information system to the new ERP system? • Please, rank the KSFs of ERP implementation based on their importance?	To identify the factors that may influence ERP system results, either positively or negatively
	Measuring and defining ERP implementation failure or success (15 minutes)	So, in relation to measuring ERP systems as success/failure: • Are there any existing instruments or methods for measuring the outcome of ERP? Has it been used before to measure this outcome? If yes, what measurement or method was used? How successful was it in measuring the outcome? • Stakeholders' satisfaction is one of the main criteria for measuring success/failure of ERP implementation. What do you think are the stakeholders? • How do you comment on suitability of stakeholder's satisfaction for ERP implementation in your organisation?	To measure ERP implementation and outcome performance
	Any other relevant aspects not discussed (3 min)	The discussion is coming to an end now, so: • Is there anything we haven't talked about that you think we should discuss?	

	Finalise interview (2 min)	• Is it possible to have additional interview in the near future **THANK YOU!!**	because this will help me to see the progress and how things change from time to time

APPENDIX B:

Top Management Interview Protocol

Targeted Participants	Stages	Questions	Rational
Top Management Level	Introduction (2 min)	Nature of research and how will be used Research study aims to investigate successful ERP implementation for higher educational institutions. This interview will be used in my PhD thesis and also for academic publications and conference papers. Recording for recollection purposes / quotes. Anything said will be treated as confidential and anonymous/ your personal data will not be passed on to anyone else. I'll nod a lot because I want to hear you, not me… Think of this as an informal chat. There are no right or wrong answers and I'm interested in your honest views and opinions about the topic. So, before we start, please fill in the consent form.	To provide a clear set of instructions for interviewers and interviewees. To get consent from interviewees.
	Warming up (3 min)	Now tell me a little bit about yourself, • Your current positon at this university? How long? • What do you do for your current role?	To help the participant feel comfortable
	General information about ERP system at your organisation (10 mins)	• Why did your organisation choose to implement ERP software? • What were the specific aims and objectives of the project? • Did these aims and objectives come directly from the business strategy? If yes, please provide specific examples of how it was perceived that ERP would support the strategy.	To know the reasons for implementing ERP system
	Issues/challenges across ERP implementation stages	• Does ERP Systems increase productivity? Please explain	The purpose of this step is not to generate logic model components but

	(15 mins – or more if they are willing to talk!!)	• What are the problems facing the staffs in responding to using the ERP systems? • Was their resistance to change? If yes. How has the management tackled the phenomenon of resistance to change to the usage of these systems? • Have you identified any needs to improve the ERP system implementation? • What form of training have been provided to the staff and what was the duration of the training? • How effective were the training provided? • What do you think about the quality and the outputs of the system?	rather to gather information that can provide evaluators with greater understanding of the general purpose of the ERP and the potential obstacles that it faces.
	Key factors influencing successful implementation of ERP system (15 mins)	Let's move from general ERP implementation to key success factors for ERP implementation. My research is particularly interested in investigating this from both technical and organisational perspective. • What are main factors that may affect the ERP implementation in your university? • Please, rank all the factors based on their importance ? • How these management factors may help or hinder the ERP from achieving its goals'	To identify the factors that may influence ERP system results, either positively or negatively
	Measuring and defining ERP implementation failure or success (15 minutes)	So, in relation to measuring ERP systems as success/failure: • Are there any existing instruments or methods for measuring the outcome of ERP? Has it been used before to measure this outcome? If yes, what measurement or method was used? How successful was it in measuring the outcome? • Stakeholders' satisfaction is one of the main criteria for measuring success/failure of ERP implementation. Who do you think are the main stakeholders? • How do you comment on suitability of stakeholder's	To measure ERP implementation and outcome performance

		satisfaction for ERP implementation in your organisation?	
	Any other relevant aspects not discussed (3 min)	The discussion is coming to an end now, so: • Is there anything we haven't talked about that you think we should discuss?	
	Finalise interview (2 min)	• Is it possible to have follow up interview in the near future? (if required) **THANK YOU!!**	

APPENDIX C:

Certificate of Ethical Approval

Applicant:

Abdallah Abu Madi

Project Title:

Successful ERP Implementation in Higher Educational Institutions (Case of Jordan)

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Medium Risk

Date of approval:

27 February 2017

Project Reference Number:

P50975